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The Decisions in England. IN our last two issues we have given very full details as to the recent electric lighting decisions in England, touching incandescent lamps and the alternating current system. This week the letter of our English correspondent will be found of great interest, as giving further details and presenting some of the views taken in England as to the main controversy.

Measuring Magnetic Intensity. IN many investigations, especially in the construction of dynamo machines, it is necessary to know the intensity of the magnetic field, and a convenient apparatus for determining this is evidently of some value. The instrument described in another column, and designed for this purpose, utilizes a principle which has already been applied inversely to the determination of current strength with a constant magnetic field, the motion of the mercury being employed as an indicator of the current strength as well as a meter. In the latter case the flow of the mercury is caused to actuate a registering apparatus. In the present instance, this is reversed. A constant current is employed, and the height of the mercury is varied by the different strengths of the magnetic field. Of course, the apparatus can only be applied in such cases where the mercury can be placed in the direct path of the lines of force, so that in constructions in which the magnetic circuit is entirely closed, a modification would be necessary.

Mr. Jay Gould Selling Out. CONSIDERABLE attention has been given lately in the inner circles of Wall street to a report that Mr. Jay Gould is sick and tired, and that as one of the first steps toward convalescence he proposes to sell his telegraph properties. More than this, it is said that the purchasers are to be the Vanderbilts, co-operating with powerful bankers, among whom are named Drexel, Morgan & Co. This is about as far as the current story goes, although there is another version to the effect that when the transfer is effected it will be found that a union has been effected between the telegraph and telephone interests. There are elements of plausibility and probability in the rumors, which are, as usual, heartily believed in some quarters and flatly contradicted in others. If Mr. Gould should sell out, he is likely to make good terms for himself, and one inference might be that he had allowed the cable war to end in order to put telegraph stocks at a better price. At any rate, it may be taken for granted that he will not display any of the weakening of intellect and downright imbecility with which some of the papers have been crediting him.

Unsophisticated Travelers. IT might be supposed that visitors to good hotels were now generally familiar with the electric light, and knew enough to turn the key in the socket. But there are still some amusing displays of ignorance, and a correspondent in this State sends us note of one of the latest. A lady staying at the best hotel in the place grasped the insulated wire from which one of the incandescents was hanging, and tugged at it under the impression it was a bell pull. Unable to get any result with one hand she applied both, and did not relax or relent until she had jerked the globe clean off. When at last she had an opportunity of explaining her action, she said she taken the lamp to be a bell connected with the hotel office. Not only was her chagrin great on learning her mistake, but she nearly fainted at hearing that she might have brought a current of electricity over the wire. She "would not have touched it for a farm," she said, but her idea was that they "had them chained up in an iron tank." This lady, it appears, came from one of the rural sections of the State. Evidently there is still room for missionary work, and what is wanted is not less but more of popular science.

National Control of Telegraphs A BILL just passed by the United States Senate promises to have an important effect on the status of telegraph companies as related to the national government. This measure places in the charge of the Inter-State Commerce Commission the telegraph lines of all railroads that have received help from the nation in the way of subsidies, and requires the Commission to see to it that there shall be no discrimination in rates. Each subsidized railroad is henceforth to operate its own telegraphs, and it is to allow all telegraph companies equal facilities in the use of the lines as a means of communication between the two oceans. This is a movement likely to be attended with notable results, and yet it looks like a mere preliminary to the other bill reported to the Senate, in which it is proposed to place every telegraph line doing an interstate business within the supervision of the Commission following closely the rules and practices that have been enforced in regard to railway management. At the time that the Inter-State Commerce act was first brought up, we predicted that it would not be long before there would be an extension of its principles to the telegraph system of the country, and the point has been reached even sooner than was expected. It is to be hoped that should the present bill become law it will serve to assist telegraphic communication rather than restrict it, and that the scrutiny of the Commission may subserve the best national interests.

Electrolysis by Alternating Currents WHEN the alternating current first came into prominence as a method of electrical distribution, the objection raised against it was, that it could not be utilized for the driving of motors, nor for the charging of storage batteries, two essential qualifications of the continuous current. Since then the problem of designing alternating current motors has been vigorously attacked, and although such motors are not yet in general use, sufficient progress has been made to warrant the assertion that before long they will have assumed a practical and commercial form. But the statement that alternating currents could not be used for electrolysis has thus far remained unchallenged, for, although it was claimed that by the re-conversion of the alternating current to the direct current electrolytic operations can be performed, it was not until recently that actual electrolysis has been accomplished. We give, in another column, some account of experiments in which this has been carried out. It will be noted that the determining point in one case was the size of the electrodes employed. It must be admitted, however, that although electrolsis took place, the products were not such as would have been developed by the continuous current, for it will be noted that the gases deposited at either pole were in both instances the same; that is, in one case it was a mixture of the cation and anion, and in the other only one element was set free at both poles. Hence, though the experiment does not prove that the alternating current can be applied for ordinary electrolytic operations, it brings out an interesting fact relative to the influence of the size and nature of the electrode and of the quality of the solution upon the products obtained in electrolysis with alternating currents. It is only when the alternating current is able to separate the constituents of the electrolyte completely that it can take the place of the continuous current for electrolytic purposes.

The Dangers of Alternating Currents.

Mr. Harold P. Brown, whose letter to the New York *Evening Post* on the danger of alternating currents called forth replies from many quarters, as printed in full in this journal last week, gave a demonstration at Columbia College on Monday, July 30, in which he showed by experiments upon dogs the limits of safety to animal life with varying pressures of the different qualities of current. A crib for containing the dogs had been prepared and connections were made with an Edison 1,200 volt continuous current "municipal" dynamo; also with an alternating machine whose E. M. F. could be varied from 100 up to 1,000 volts, and an arrangement was also provided for effecting a pulsatory continuous current.

Accompanying the demonstration Mr. Brown read a paper in which he sought to refute the attacks made upon him, and in which he gave the results of his previous experiments. Thus, he showed that the continuous current, with no provision or by-pass for taking the extra current, proved fatal at 800 volts. But with provision for taking the extra current a dog had stood 1,420 volts before death ensued. The alternating current at 288 alternations per second, however, proved fatal in 15 seconds, at an E. M. F. of 160 volts. The animal became rigid in five seconds, and died without uttering a sound and without a struggle. At the time of our going to press, Mr. Brown was proceeding with his experiments to prove these statements.

The Weymersch Battery.

There has recently been brought out in London a new depolarizing mixture for batteries of the Bunsen type, and which has been discovered by Mr. Weymersch. A report of tests recently made by Messrs. Alabaster, Gatehouse &Co., on the new depolarizer shows it to have some excellent properties.

A preliminary trial was made with three square, open jars, each having the following internal dimensions: 8¼ inches × 8¼ inches × 12 inches deep. The quantity of liquid sulphuric acid and water in the proportion of 1 to 20 in each jar was about 16 pints. Immersed in this solution were two 6⅛-inch wide zinc plates to the depth of 6½ inches. Between the zinc plates and placed in a porous pot 7½ inches × 1½ inches × 12 inches deep, containing nearly 3¾ pints of the depolarizing fluid was the carbon electrode of the same linear dimensions as the zincs. These cells were connected in series to an ampèremeter, the current being adjusted by iron wire resistances to 10 ampères or thereabouts, and kept in circuit for 26 hours. The results obtained showed that the battery ran for 26 hours without the current ever falling below 10 ampères or varying more than 5 per cent., and with a drop of less than 5 per cent. between the maximum and minimum free potential of the cells, whilst an actual rise in the working or available E. M. F. took place. The measured consumption of zinc in the battery, moreover, was only about 8 per cent. above that indicated by theory.

Another battery of five cells precisely similar in all respects to the above was then tested. After keeping the cells on closed circuit for 31½ hours the experimenters were compelled, owing to their desire not to leave the battery alone through another night, to put an end to the experiment. During this lengthened run the free potential of the battery did not vary more than approximately 3 per cent. The working electromotive force was practically the same at the end of the test as in the beginning, and the current varied only between 10 and 10.6 ampères.

The actual and theoretical consumption of zinc differed by only 10 per cent., which agrees closely with the data obtained in the preliminary trial. The cell has an E. M. F. of about 1.8 volt, and, with the size stated above, an internal resistance of only 0.065 ohm. It is said that the depolarizer can be manufactured at 12 cents per gallon.

Gravity Battery Measurements.

BY JOHN BEATTIE, JR.

During the last six or seven months I have been constantly engaged in making measurements, in order to test the comparative efficiency of common zincs and amalgamated zincs, as used in gravity batteries. I thought it possible that the results of workshop tests, the kind of instruments used, and methods adopted, might interest some of the many readers of THE ELECTRICAL WORLD.

My first work was upon gravity batteries as used in fire alarm systems, and, in order to go about it intelligently, it was necessary for me to know the current required to hold up armatures and prevent false alarm taps. None of the attendants seemed to know whether the current used was 40 or 500 milliampères. They did not know that

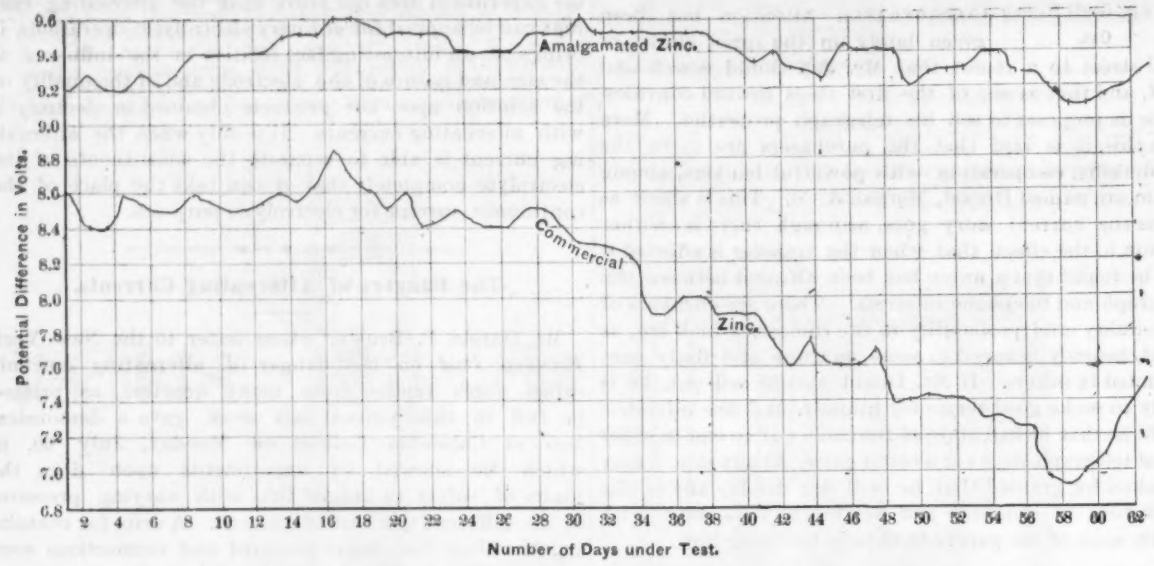


FIG. 1.—E. M. F. OF GRAVITY BATTERY WITH BEATTIE AMALGAMATED AND COMMERCIAL ZINC.

when the galvanometer indicated 30 degrees all was right, and that when the needle began to drop something was necessary to be done.

The usual proceeding was to add more blue vitriol. A goodly portion of this fluid sometimes put the battery in good condition, even if the sulphate of copper crystals came in contact with or lodged upon the zinc (which, of course, should never be allowed to happen, because local action immediately sets in when it occurs). When blue vitriol would not send the blue line up midway between the zinc and copper, a reduction of the specific gravity of the upper, or sulphate zinc, solution was necessary. This helped the battery greatly. When the zinc became coated with a thick layer of metallic copper, zinc oxide, and iron sulphate, the battery was taken down, cell by cell, and the zinc scraped and pounded until (when not thus broken) it was comparatively clean. The battery was then assembled in the following order: copper, sulphate of copper crystals, water, zinc, old sulphate of zinc solution 30° to 40° Baumé. Then the cell was usually short circuited for several hours, to make the blue line go down. This last operation is extremely wasteful and needless, and thousands of dollars might be saved in zinc alone by adopting more common sense methods.

The battery being now in proper condition, the galvanometer indicated 30°. In order to find the meaning of "30°," an ammeter was put into a circuit of 72 cells (Garnewell), having "Beattie" zincs for positives. A current of 90 milliampères was found to be flowing and the fire-alarm galvanometer indicated 30° "full." Ten cells were then taken out and tested. The ammeter showed 80 milliampères and the galvanometer 29½°.

Twenty cells of gravity battery were then properly set up in my laboratory, and put at work upon resistances of German silver wire. Readings for E. M. F. current, internal resistance and potential difference were taken every morning, except Sundays, for three months.

Ten cells in series, with the best commercial crow-foot zincs for positives, and ten cells in series with Beattie amalgamated zincs for positives, were set up, each series of ten cells sending a current through an external resistance of 110 ohms for the three months. The measuring instruments used were the following: Ayrton & Perry voltmeter, reading from 4 to 21 volts; Carpentier's ammeter, calibrated by Prof. Anthony, of the Mather Electrical Company, and reading from 0 to 2 ampères; Bradley's tangent galvanometer and resistance coils; the Hartmann & Braun galvanometer, bridge and resistance coils.

It was my intention to perform accurate, painstaking work, for the success of which I am indebted to my assistant, Mr. Wm. B. Edgar.

The results obtained are plotted on the accompanying diagram. As will be seen, the cells containing the Beattie amalgamated zinc varied in E. M. F. only between the limits of 9.1 and 9.6 volts, the difference between the readings of the first and last days being only .1 volt. With the best commercial zincs, however, the E. M. F. varied between 8.85 and 6.9 volts, with a difference of 1.1 volt between the first and last readings.

In the same way the current from the cells containing the Beattie amalgamated zincs was much stronger and more constant than in those with the ordinary zincs. As will be seen in the diagram, Fig. 2, the amalgamated zinc cells increased in current strength from 77 milliampères to 80 milliampères on the last day, and rose as high as 83 milliampères. Whereas the ordinary zincs gave a current varying between 73 and 59 milliampères, and dropped from 70 milliampères on the first day to 61 milliampères on the last.

The Value of Lightning Rods.

To the Editor of The Electrical World:

SIR: I noticed an article taken from the Philadelphia *Record* and printed in the *Evening Star* of this city, on the subject of "Lightning Rods," by Chief Walker, of the Philadelphia Electrical Department, in which he stated that lightning rods are going out of use. I think the author has not kept himself thoroughly posted in that line. In the first place there are ten houses protected now to one fifteen or twenty years ago. I do not mean with the old style lightning rods of iron and carefully insulated with glass rings; but with good copper rods and good metal roofs of copper or tin, well connected with our system of iron sewer pipes. And as copper is forming a large part in the construction of our modern city buildings and their copper cornices, finials and gutters, are well connected and terminate in the sewers, I claim they are a safe protection against lightning.

He also says that the object of a lightning rod is to attract the lightning. Who would suppose for an instant that a charge of electricity traveling with such terrible velocity, an agency which can destroy immense buildings, shiver large oaks, split solid rock and break down half a mile of dense air, which is a bad conductor, could be drawn aside by an insignificant lightning rod. Not only is the idea that a lightning rod attracts electricity unsupported by any facts, but it is at variance with the whole course of experience. The idea that a lightning rod attracts electricity or is a positive evil appears to have arisen entirely from assumption and a partial consideration of facts, or from superstition, prejudice or ignorance, rather than from science or experience.

It will be found that the action of a pointed conductor upon a flash of lightning is purely passive; it is rather the patient than the agent, and conductors can no more be said to invite a charge of lightning than a rain-spout can be said to attract to a building the water that flows through it. If metals do possess the power of attracting or drawing the lightning to our houses, then are the people generally endangering their lives and property by the use of metallic roofs, pipes, gutters, gas and water-pipes, bell wires, metallic chimney caps, etc., that have no earth connections. I agree that too little attention has been paid to earth terminals; while the combinations of different metals when laid in moisture oxidize and make the rod useless, as I have found, in many cases.

I believe all the buildings damaged by lightning can be accounted for in the following ways: 1. Improper ground connections. 2. A too scanty use of rod on the building. 3. Insulators and the mass of metal on the building not being connected with the rod insulation. The latter can do no possible good to prevent a charge of lightning leaving the rod and going to the building, provided it could find an easier path, or path of less resistance, to the earth; and when the insulators become coated with a film of moisture the electricity can pass freely over them to the building, and more especially if the roof is metal and connected with the sewers, which would form a path of less resistance. In my opinion that saves many buildings from damage in a thunder storm, during which the brick, wood and other material about a building becomes oppositely electrified by the inductive influence of the cloud of electricity about it.

In addition to furnishing a path for electrical discharge between the clouds and earth it is necessary for lightning rods to be so arranged as to restore the disturbed electrical equilibrium of the building without damage to the building or stunning its inmates. This can be done by placing the rods on the chimneys or other elevated parts of the building, and not separating or insulating them from the object to be protected; and I think nine out of ten electricians or professors who have made atmospheric electricity a study in Europe and America will bear me out in this assertion. One of the most convincing arguments that properly applied lightning rods have saved many lives and a vast amount of property is the practice of rodding ships, which has been in use for more than fifty years, and there has not been a man killed, nor have marine insurance companies been called on to pay any losses by lightning where the ships were properly protected; while records show that in forty years previous over two hundred and fifty ships suffered from lightning; one ship in eight was struck and set on fire in some parts of the sails or rigging, and over two hundred seamen were killed or disabled. Such conductors have been applied to vessels without insulating them and fully establish the correctness of the theory.

Speaking of the Washington Monument, it is true it was struck and slightly damaged, but since the rods on the same have been properly adjusted, although it has been subjected to some very severe electrical storms, it has not been damaged in the least. I am of the opinion that the rod spoken of which was struck and fused on the Belmont Water-Works, if it had been examined, would have been found to have improper ground connections and to be *insulated*.

What we want is a carefully compiled record of buildings struck and deaths by lightning; how those buildings were rodded, and all particulars that would be of use to us in protecting our houses; and last, but not least, a conference of the most eminent electricians, the same as was held in England in 1878. Lightning rods should not be condemned merely from prejudice. ELECTRICIAN.

WASHINGTON, D. C.

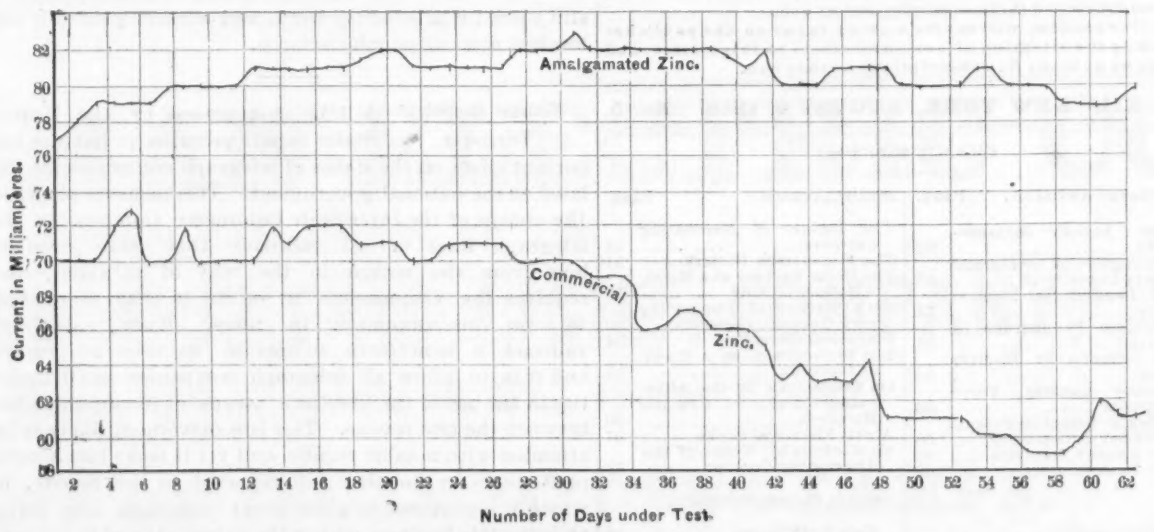


FIG. 2.—CURRENT FROM GRAVITY BATTERY WITH BEATTIE AMALGAMATED AND COMMERCIAL ZINC.

Practice in Dynamo Construction.

To the Editor of The Electrical World:

SIR: I was much interested by Mr. Robert Dobbie's tabulated description in your issue of July 21 of three dynamos built by him, but was a little disappointed by the lack of details. I think it would be of interest to many of us if Mr. Dobbie would give full data regarding these machines. He does not say what the voltage is; and the size of the armature, density of current in armature conductor, size of armature wire, and other minor details are lacking. It would be also important to know the form of the field magnet, though the inference is that it is the original Gramme 4-pole magnet frame.

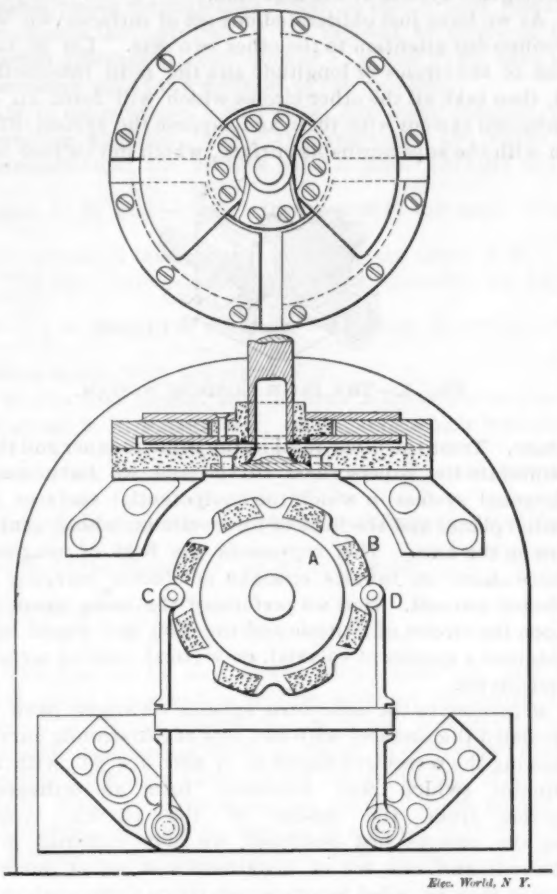
LYNCHBURG, Va. CECIL P. POOLE.

The Holtz Machine as a Motor.—Historical Note.

BY PROF. E. L. NICHOLS.

A gentleman who witnessed the driving of a Holtz machine as a motor during one of the lectures of the regular course on electricity before the sophomore class of Cornell University, has given a description of that experiment in THE ELECTRICAL WORLD in the issue of Feb. 4, 1888.

Although not new, this is one of the most striking of lecture experiments. It is, however, not very generally



FIGS. 2 AND 3.—SPRAGUE STORAGE CAR SWITCH.

known, if we may judge from the notice which the above-mentioned article received, and a few words concerning its origin may be of interest.

Sylvanus P. Thompson, in his text-book, "Elementary Lessons on Electricity and Magnetism," p. 53, makes mention of the reversibility of the Holtz machine, the discovery of which he ascribes to Mascart.* The first to notice this phenomenon was, however, undoubtedly Holtz himself, who describes the same in 1867, only two years after the appearance of the earliest form of his influence machine. After describing two other peculiarities of the machine, which was of the original type, with two horizontal plates driven in opposite directions, Holtz says:

"A third peculiarity of the apparatus showed itself when I connected the poles of the same with the poles of another influence machine. When the latter was put into motion, both plates, previously detached from the driving belt, began to revolve, but in opposite directions. The lower plate, however, soon came to rest, whereupon the other moved with redoubled velocity. When this one was held fast the lower one began to revolve very rapidly again.

"The force of these motions increased with the quantitative performance of the other machine; that is to say, with the force which the driving of that machine demanded.

"A comparison of these forces showed, however, great electrical losses. When the apparatus [previously used as a motor] was driven as an influence machine, the other machine, if freed from its belt and started in the reverse direction, would maintain its rotation alone. In this case the relation between the two forces in question was still more unfavorable.

"We may then assume that every apparatus which, through influence and mechanical motion, performs electrical work, will also, on the other hand, through influence and electrical work, perform mechanical work; that, however, the construction of a given machine will in each case be better adapted to one of these functions than to the other.

"The two pieces of apparatus which I connected were indeed good electrical machines, but poor machines for the development of power, and to this fact in particular we may ascribe the great loss of power or electricity."†

We have here, then, from the inventor of the Holtz machine, not only a description of the phenomena upon which the experiment of that machine driven as a motor is based, but also a general statement of the reversibility of all forms of the influence machine.

His statement of that principle is not couched in the precise terms now in vogue, but it is as clear a statement as could have been expected at that early stage in the development of the doctrine of energy.

The matter was immediately taken up by the celebrated founder and editor of the *Annalen der Physik*, who described various elements of his own in subsequent volumes of that magazine,* and later by Christiansen,** Gruel†† and others; but the origin of the experiment unquestionably lies with Holtz; unless, indeed, we see fit to trace it to still earlier attempts to convert static electricity into motion. In such a case our quest would lead us backward into the eighteenth century, to end perhaps with Benjamin Franklin and his electrical turn-spit.

* See Mascart, *Traité d'Electricité*, T. 2.

† Freely translated from the German of W. Holtz, *Annalen der Physik und Chemie*, Bd. 130, p. 170, 1867.

* Poggendorff, Reaction zweier Influenzmachinen auf einander, *Annalen der Physik und Chemie*, Bd. 131, p. 495; also Bd. 139, p. 513.

** Christiansen, *Annalen der Physik und Chemie*, Bd. 137, p. 490.

†† Gruel, *Annalen der Physik und Chemie*, Bd. 144, p. 644.

§ Read before the Physical Society.

On a Method of Comparing Very Unequal Capacities.§

BY A. H. FISON, D. SC.

On this method one coating of each condenser is joined to earth and to one end A of a high resistance (20,000 or 30,000 ohms), through which a current is flowing. The small condenser is charged to the P. D. existing between the ends A B of the resistance and discharged into the large one. This is repeated a great number of times. If C be a point between A and B, the resistance between A and C may be varied until the P.D. between them is equal to that between the coatings of the condensers after n operations. If the insulated coatings be now joined to C through a galvanometer, no deflection will result. The relation between the capacities C_1 and C_2 of the large and small condenser is given by

$$\left(1 + \frac{C_2}{C_1}\right)^n = \frac{R_{AB}}{R_{BC}}$$

where R_{AB}, R_{BC} are the resistances between A B and B C respectively. Since time is required to perform the operations, the instantaneous capacities cannot be compared, and accordingly the measurements are taken after a definite time of electrification. A special rotating key was shown for performing ten operations per revolution, in which a trigger arrangement was provided for stopping the rotation after a predetermined integral number of revolutions. The method has been used for comparing a small air condenser with a microfarad. The capacity of the power was also calculated electrostatically (correction being made for the edges), and that of the latter measured electro-magnetically by a ballistic galvanometer. The results give a value for v equal to 2.965×10^{10}. In these experiments the capacity of the rotating key was allowed for. Under favorable conditions capacities in the ratio of 1 to 1,000 or 1 to 10,000 can be compared with an accuracy of one-quarter per cent.

Professor Ayrton thought the novelty of the arrangement was in the rotating key, as the method of comparing unequal capacities by charging the smaller and discharging it into the larger a considerable number of times had been described and used by himself and Professor Perry in their experiments on the specific inductive capacity of gases.

Regulating Switch for Storage Battery Cars.

To the Editor of The Electrical World:

SIR: In your issue of July 21 there is described "The Julien Regulating Switch for Storage Battery Cars." There exists no doubt of the use of this switch by the Julien Company; but there do exist facts to show that the switch should not exclusively be called the "Julien Regulating Switch." A similar switch has been used by the Sprague Electric Railway and Motor Company in experimental working, Mr. Sprague having designed such a switch some years ago.

I might add that a modified form of the above switch has been used in all of the street car work of the Sprague

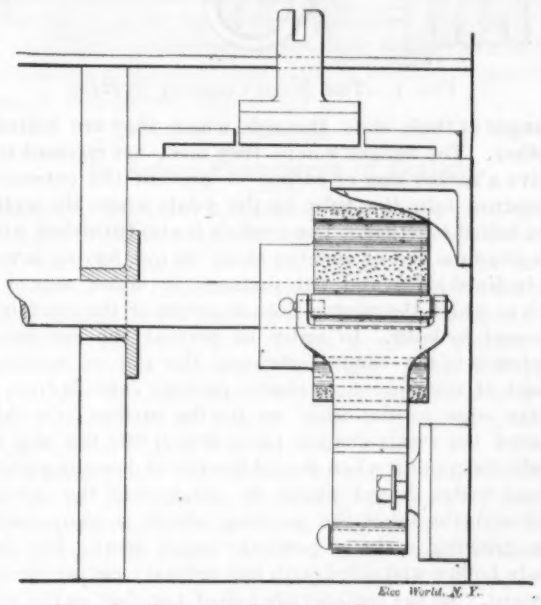


FIG. 4.—SPRAGUE STORAGE CAR SWITCH.

Company. The diagram, Fig. 1, contains a development of the *first* form of the regulating switch used by the Sprague Company. This also shows the connections of the regulating switch with the battery and motors. The workings of this switch will be plain to all who read the description of the so-called Julien switch.

Figs. 2, 3 and 4 illustrate the circuit breaker. This circuit breaker is on the same spindle as the cylinder of the regulating switch. In Fig. 3 *A* is a metal cylinder in which are set blocks *B* of insulating material. *C* and *D* are contact rollers. These contact rollers make the circuit to the switch when they are on the metal cylinder and break the circuit when they are on the insulating material. They rest on the insulating material when the switch cylinder is turned from one position to another.

The regulating switch as here shown has *six* positions. Subsequent practice dictated some changes in the details.

That many advantages can be gained by the use of such a switch is obvious. As shown in Fig. 1, two motors are attached to each car. Each of these motors is of 7½ h. p. at 200 volts, with 90 per cent. efficiency; the speed with these conditions is 700 revolutions per minute. These motors are series wound and of very low resistance. In spite of the high efficiency of these motors, together with the advantages of a regulating switch more nearly perfect then the one above described, the experiments made by the Sprague Company have so far indicated that the storage system, so far as efficiency is concerned, cannot be compared with the overhead or conduit systems.

NEW YORK CITY. H. F. PARSHALL.

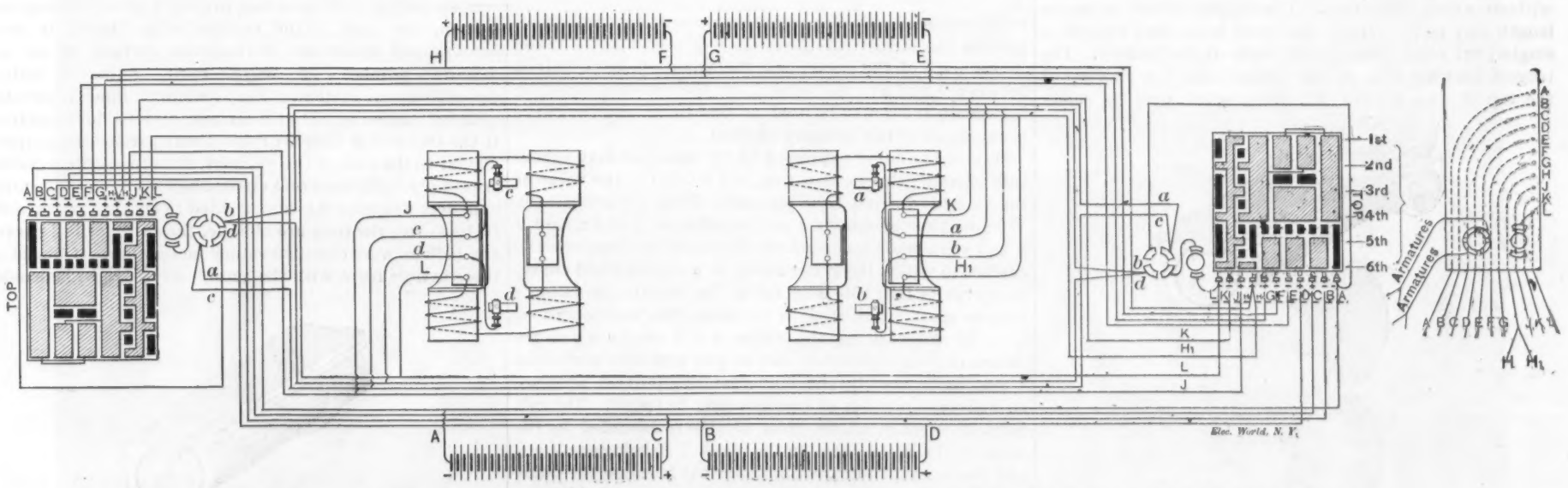


FIG 1. DIAGRAM OF SPRAGUE ELECTRIC STORAGE CAR SWITCH AND CONNECTIONS.

Irish's Conduit for Electric Wires.

Our illustrations represent a form of conduit recently designed by Mr. W. E. Irish, of Cleveland, O., for holding electric wires of all descriptions. In this system the wires may be drawn through from one junction box to another in one continuous length, as through ordinary pipes, and the whole system of wires can be renewed without interrupting communication or displacing the surface excepting at the manholes. It is, however, preferable that the cover of the conduit be removed whenever practicable, and the wires carefully laid in their respective ducts.

As will be seen in the accompanying illustration, the conduit consists in a tubular pipe in sections, having

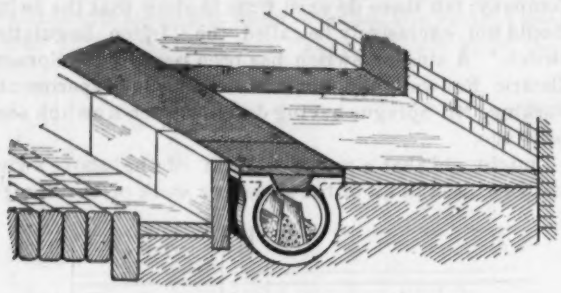


FIG. 1.—THE IRISH CONDUIT SYSTEM.

flanges at their ends through which they are bolted together. The flanges where they meet are recessed to receive a rubber ring or gasket to prevent the entrance of moisture into the tube by the joints where the sections are bolted together. The conduit is also furnished with a longitudinal slot or opening along its top, having inwardly inclined sides and flat surfaces on either side of the slot to which the paving slots or covers of the conduit are secured by bolts. In order to prevent the entrance of moisture to the conduit through the slot or opening, a sheet of waterproof or elastic packing extends from one outer edge to the other on the flat surface. On this is placed the wedge-shaped piece which fills the slot and seals the conduit when the lid is screwed down in position. These wedge-shaped pieces fit snugly into the opening, and with the aid of the packing, which is compressd by the screwing, make a perfectly sealed joint. The lid is made hollow and filled with the ordinary paving stone or cement. As the sections are bolted together or the cover screwed down, the elastic packing is compressed with considerable force, filling every crevice where moisture could possibly enter.

From the illustrations, Figs. 1 and 2, it will be noted that wires for all electrical purposes are placed in separate ducts in the same conduit. Arc wires are laid in one duct in the hollows of corrugated sheets of asbestos cloth, each layer of the insulated wires being covered by a corrugated sheet of asbestos. The telephone wires are laid in rows between corrugated sheets of thin iron, previously coated with a protecting varnish to prevent rust. Incandescent light and telegraph wires may be protected as arc and telephone wires, or loosely laid in their respective ducts without extra protection. Continuous wires miles in length may be laid from one point to another without a single joint other than those made in the factory. The longest lines are laid at the bottom and the shortest at the top of the ducts. All these wires may be easily

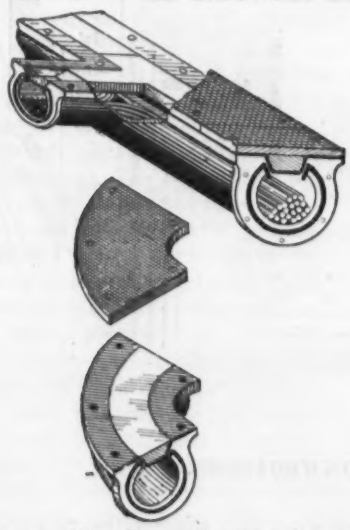


FIG. 3.—THE IRISH CONDUIT SYSTEM.

reached at any point throughout their length for tapping, repairing and renewing, and any additional wires added by removing the cover. Fig. 3 represents an elbow or branch conduit, and Fig. 4 a crossing, junction or test box. Fig. 5 shows a street crossing or corner with lamp-post, and Fig. 6 illustrates several sections of the conduit connected and diminishing in size as wires are led away through the several branches.

Flow of Current.

To the Editor of The Electrical World:

SIR: Will you kindly inform me if a current in a wire really flows, or is it only an expression used in explaining electricity? S.

ANSWER.—There is no fact yet developed to prove that current "flows" in a wire, that expression being derived by analogy, and being, as you suggest, merely a conventional term.—EDS. E. W

"Potential Geometry."—II.

BY TOWNSEND WOLCOTT.

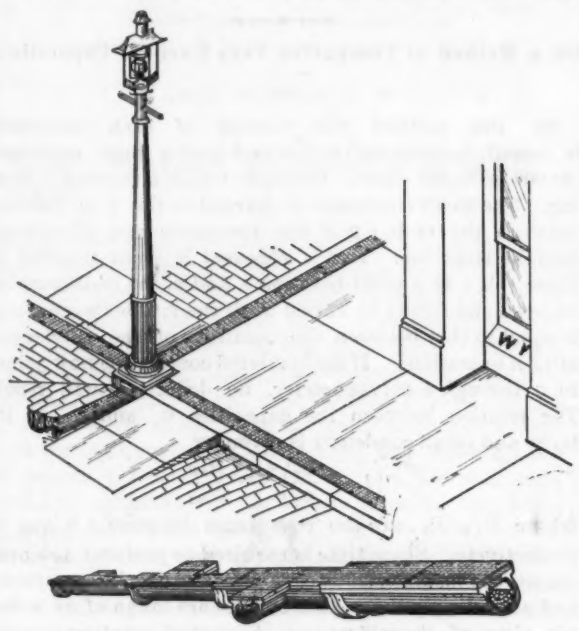
We will now proceed to treat problems in three dimensions. It is customary to represent a curve in space by two equations, which are the equations of the traces of the curve upon two of the coördinate planes. There is, however, another way which we will use in conjunction with this.

The equation of a surface is a function of two independent variables. If in this equation one of the independent variables be made a function of the other, we have the equation of a curve lying upon the surface. It is evident that for a given surface there are an indefinite number of curves which will fulfill this condition. These curves I call the superscribed curves to the given surface. In this method any curve whatever may be expressed as a function of a single independent variable; in fact, the only reason that in the ordinary method any plane curve can be so expressed is that the very words plane curve express the condition that the curve shall be superscribed on the plane.

On the other hand, having obtained the equation of a superscribed curve we may find an indefinite number of surfaces on which the curve is superscribable by reversing the process.

Thus, if $y = F(x, z)$ is the equation of a surface, and we assume the equation $z = \varphi(x)$, by substitution we eliminate z and have y expressed in terms of x alone, say $y = \text{F}(x)$.

Now so long as this curve is regarded as a superscribed curve to the surface $y = F(x, z)$, it is, as we have said,



FIGS. 5 AND 6.—IRISH'S CONDUIT SYSTEM.

fully expressed by this equation, $y = \text{F}(x)$. But disregarding the surface, the equation $z = \varphi(x)$ may be taken as one trace of the curve, and the equation just obtained between x and y as the other; or the resulting equation between y and z may be used as one trace, and the curve is expressed in the ordinary method.

Having the curve expressed by its traces we may substitute partially in one equation, say $y = \text{F}(x)$, the value of the variable derived from the other. Thus, say $x = \varphi^{-1}(z)$. We now have y expressed as a function of x and z, and if x and z are made independent, the equation expresses the surface to which the given curve is a superscribed curve. It is evident that this is so, for in the resulting equation z may be again eliminated by reversing the last operation, *i. e.*, by substituting the value $z = \varphi(x)$, by which we return to the given curve, and as any arbitrary portion of x may be replaced by the corresponding portion of $\varphi(z)$, an indefinite number of surfaces may be found. The cylindrical surface, whose cross section is bounded by the trace of the given curve on the plane $X\,Z$, being one limit, and the corresponding cylinder for the trace on the plane $X\,Y$ the other limit of the possible superscribable surfaces.

The tangent line to a curve lies upon the tangent plane to a surface, if the curve lies upon the surface, so that the tangent plane at every point of the curve may be conceived to revolve on the tangent line at that point as an axis, either all together or independently, each position giving a different superscribable surface.

In three dimensions we may have several kinds of orthogonal systems, only two of which are of importance here. First, a set of surfaces and a set of curves which intersect the surfaces orthogonally. These, as they correspond to equipotential surfaces and lines of force, are the prime object of our investigation; but we will also use indirectly a skeleton system of three sets of orthogonal curves.

For instance, let us take a set of concentric spherical surfaces and a set of right lines radiating in all directions from the centre. This is one of the simplest orthogonal systems in three dimensions and represents the field of force of gravity about a spherical body, such as the earth (approximately), and the field of electric force about an electrified sphere, in the absence of other electrified bodies.

Now suppose each spherical surface reticulated by an orthogonal system of superscribed curves, the simplest case being one with which we are all familiar, viz.: a system of latitudes and longitudes, as used in geography.

Next, fix the attention upon those radii, which pass through the intersections of the latitudes and longitudes, and then suppose the spherical surfaces obliterated, and we have an orthogonal system of the second kind consisting of three sets of curves, any two sets of which may be filled in with a set of superscribable surfaces, giving an orthogonal system of the first kind.

As we have just obliterated one set of surfaces we will confine our attention to the other two sets. Let us take one of the circles of longitude and the radii intersecting it, then take all the other circles which will form an orthogonal system with these and suppose the system filled in with the superscribable surface, which in this case is a

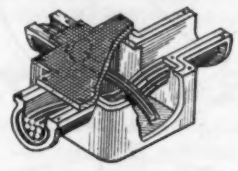


FIG. 4.—THE IRISH CONDUIT SYSTEM.

plane. Treat the other radii in the same manner and then obliterate the superscribed curves, and we have an orthogonal system in which the equipotential surfaces are radial planes and the lines of force circles whose centres are on the axis. This represents the field of magnetic force about an infinite straight conductor carrying an electric current. Had we performed the same operation upon the circles of latitude and the radii we would have obtained a system of co-axial, co-vertical, conical surfaces and circles.

Returning to the concentric spheres we might have reticulated the surfaces with two sets of loxodromic curves, making the respective angles of α and $\alpha + 90°$ with the equator (which will evidently form an orthogonal system from the nature of the curve). Applying the process just described, we may construct with the radii and one set of loxodromics a set of surfaces which may be called loxodromoids (from their analogy to helicoids), the other set of loxodromics forming the lines of force.

These transformations, if they serve no other purpose, at least serve to familiarize the mind with orthogonal systems in three dimensions, which are quite difficult to grasp. We will therefore cite a few more cases.

The simplest possible system in three dimensions is a uniform field of force, parallel planes and perpendicular right lines. If the planes are reticulated by a system of concentric circles and radii, a simple application of the transformation process will give the magnetic field about a straight conductor as before. Every developable surface has an indefinite number of orthogonal systems of superscribed curves, corresponding to every plane orthogonal system, for, any plane system being drawn, it may be wrapped about the developable surface in an indefinite number of ways, each giving a different orthogonal system. For instance, take a circular cylinder and wrap about it a plane divided into squares. If the two sets of lines are respectively parallel and perpendicular to the axis of the cylinder, the superscribed curves are simply right lines and circles, and a set of concentric cylinders will give the case treated in the last paragraph. If, however, the lines are oblique, the superscribed curves are helices with complementary inclinations. One set of these helices form with the radii a set of right helicoidal

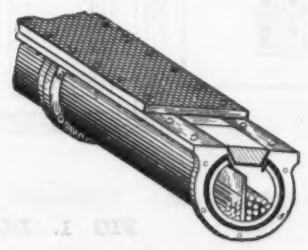


FIG. 2.—THE IRISH CONDUIT SYSTEM.

surfaces, the other set of helices being the orthogonal lines. This system is also a case which occurs in practice, *i. e.*, the flow of electricity in a helical conductor.

We may pass from any orthogonal system to any other by a repeated application of this method, if we have the analytical conditions for constructing an orthogonal system of superscribed curves for any surface, and the inverse operation of finding the surface for any orthogonal system of superscribed curves. These conditions will be investigated later, and this method will be called the indirect method.

The direct method of finding the orthogonal lines for a given set of surfaces, and the inverse method of finding orthogonal surfaces for a given set of lines, will be next investigated. As in the case of two dimensions it is necessary not only that the form of the surfaces or curves be given, but also their relative position in order that the problem shall be determinate

In the general equation of such a set of surfaces, we have the variables x, y and z, one or more variable parameters and one or more constants. The parameters are not independent, but all but one may be eliminated, and that one expressed in terms of the direction of the normal to the surface, by means of the partial differential coefficients.

If x', y' and z' are the co-ordinates of the curves which intersect the surfaces orthogonally, we have at any point of the system $x = x'$, $y = y'$ and $z = z'$. Also the normal to the suface at that point, is the tangent to the curve which passes through that point, so that it only remains to express the direction of the tangent in terms of the partial differential coefficient of x', y' and z', to have the necessary data for a solution of the problem.

If, in the equation, $z = F(x, y)$, x be made constant, the resulting equation, $z = F(y)$, represents the curve of intersection of the surface with a plane parallel to the plane $Y\ Z$, and $-\frac{d\,y}{d\,z}$ is the tangent of the angle which the normal of this curve makes with the plane $X\ Y$.

For the corresponding curve $y = constant$, we have, $-\frac{d\,x}{d\,z}$ = tangent of the angle which the normal of this curve makes with the plane $X\ Y$.

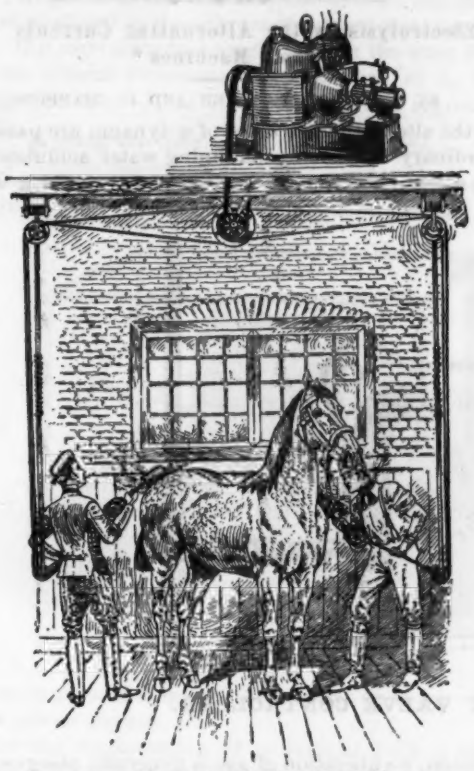
If $z' = \varphi(x')$ and $z' = \psi(y')$ are the traces on the planes $X\ Z$ and $Y\ Z$, respectively, of a curve which intersects this surface orthogonally, then $\frac{d\,z'}{d\,x'}$ and $\frac{d\,z'}{d\,y'}$ are the tangents of the respective inclinations of the tangents of these traces to the plane $X\ Y$; or in other words, $-\frac{d\,x}{d\,z} = \frac{d\,z'}{d\,x'}$, and $-\frac{d\,y}{d\,z} = \frac{d\,z'}{d\,y'}$.

This does not by any means show, however, that an orthogonal plane system will be obtained by taking the traces of all the curves in one plane, and making one variable, constant in all the surfaces, as each curve would require a different value for the constant in the same surface. True, we might select the curves whose points of ntersection with the surface lie in a plane, but unless this condition is also fulfilled at the other surfaces, which is inot in general the case, there would be no orthogonal system.

NOTE.—A few errors crept into Part I. of this article on page 29 of our last issue. In the second column, second line above Fig. 3, $\frac{y^2\,x^2}{2\,x}$ should read $\frac{y^2 - x^2}{2\,x\,y}$. In the sixth below Fig. 3, x should read x', and in the denominator of the expression under the integral sign, y should read y'. In the seventh line below Fig. 4 read $-\frac{d\,x'}{d\,y'}$ for $\frac{d\,x'}{d\,y'}$; and in the fifth line from the bottom $n\ x^2 + y = a^2$ for $n\ x^2 + a\ y^2$. In the fourth line from the bottom, $\frac{b^2}{a^2}\ n$ = a constant, should read $\frac{a^2}{b^2} = n$.

The Phonograph as a Ruler of Posterity.

We fear, says the London *Spectator*, that the phonograph may add to the great picture galleries of our great houses voice galleries almost more impressive, from the vivacity with which grandparents and great-grandparents



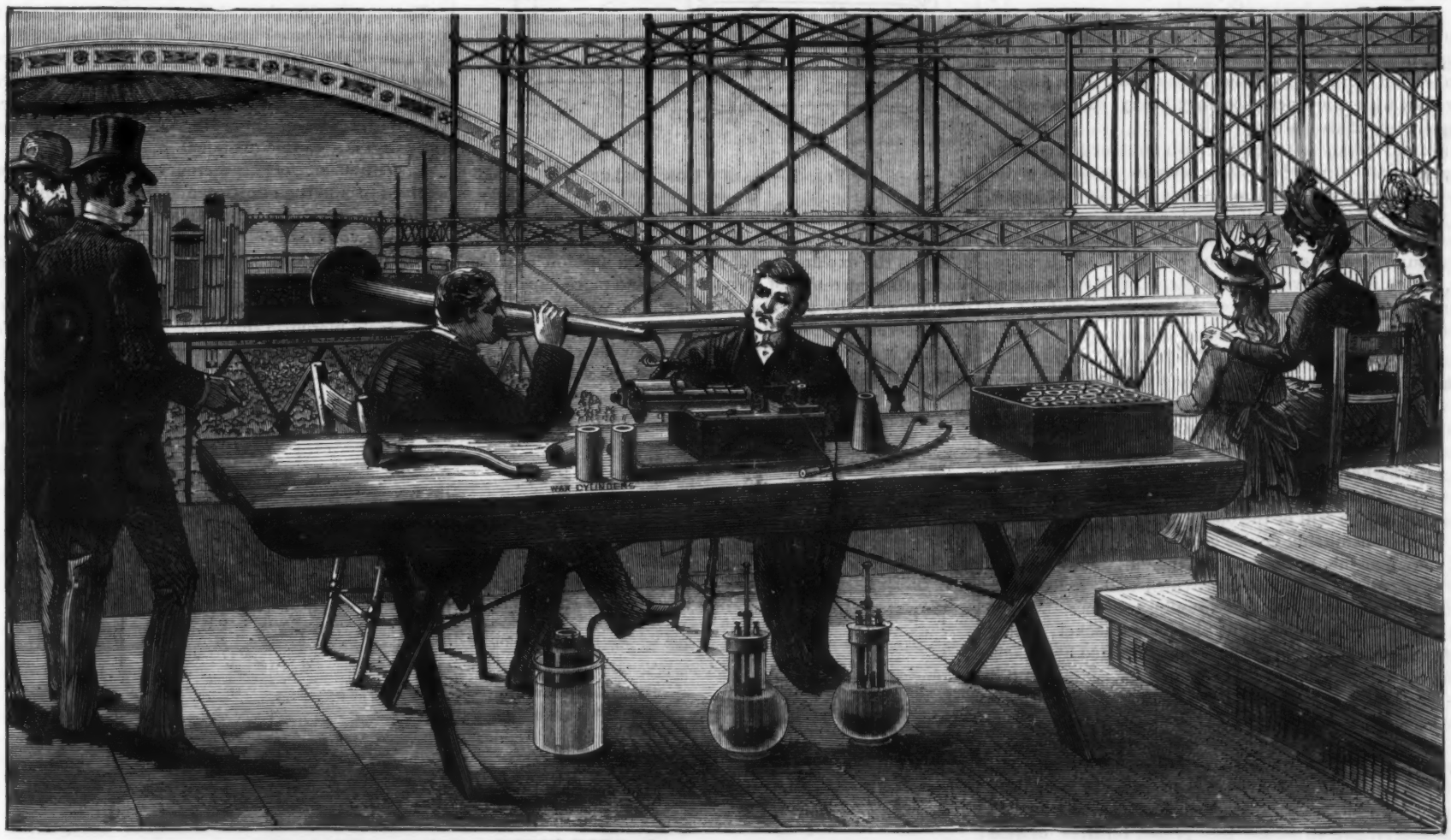
CLEANING HORSES BY ELECTRIC MOTOR.

may be made to address the descendants who never knew them, and that, too, in all sorts of contending strains. Imagine a man in the next century whose great-grandfather was a Gladstonian, whose grandfather was intrusted with a command in the war with Ireland to which home rule had led, and whose father had sided with the Irish in resisting the oppressions of the restored government—and imagine these ancestors addressing their descendant in all the different accents of political passion to which their different situations in life had given rise, while their portraits look severely down upon him, enforcing by their expression the earnestness of their political view—would not such a man carry into life a consciousness even more hesitating and divided than even that which gives birth to our 19th century vacillations? Or imagine a man in the same century whose great-grandmother was a vehement partisan of women's suffrage, whose grandmother was a lady doctor who held that the nerves of the women of the day had been ruined by educational overpressure, and whose mother, after carrying a law for embodying Amazon regiments and womanning a few ironclads, had emigrated to escape the consequence of the French conquest of our Southern counties—and imagine him listening to the most characteristic utterances of each of these ancestresses as they frowned upon him from the living canvas on his walls—would not he, too, carry into life a very strange complexity of vivid associations such as might easily embarrass him with the singular conflict of their pathetic eloquence? We have a very strong belief that the scientific ingenuity of our day, acting under the imperious guidance of sensibilities, which are as narrow as they are tender, will contrive to fill the world we leave behind us much too full of us for the free growth of our posterity, and that a time will come when it will be necessary to preach a sort of iconoclasm toward the pieties of ancestry in order to clear the way for anything like independent growth. One of the most effective of Arabian fairy tales describes how the prince who is to break the spell of the wicked magician's enchantment has to pass along a way where voices in the greatest confusion address him on every side in every accent of scorn, or ridicule, or indignation, all appearing to come from the mere stocks and stones beside his path. Was this an unconscious anticipation of the phonograph? We much doubt whether Edison's wonderful and admirable discovery, and the extensions that must follow, will not tend to bewilder the world in which our children's children live, at least as much as the outcries of the bewitched valley of rocks bewildered the hero of that eastern tale.

The Edison Phonograph in England.

As we have already announced, the Edison phonograph has been taken to England, where it has already recorded some notable music. Our illustration, for which we are indebted to *The Illustrated London News*, shows the phonograph recording a performance of Handel's music, the instrument reporting with perfect accuracy the sublime strains, vocal and instrumental, of the "Israel in Egypt," as received by a large horn or funnel projecting over the balustrade in the vast concert room in the north transept of the Crystal Palace, near London.

The phonograph was worked by Mr. De Courcy Hamilton, one of Mr. Edison's assistants, who took it abroad. The phonograms obtained were sent to Mr. Edison and will probably be heard in public before long, so that we may practically be able to attend Crystal Palace Handel Festivals in New York.



TAKING PHONOGRAPH RECORDS AT A CONCERT, CRYSTAL PALACE, ENGLAND.

Horse Cleaning by Electric Motor.

We illustrate herewith a Wells machine for cleaning horses, operated by a Sprague motor, in the Des Moines, Ia., street railway company's barn. This is the second installation of the kind made there. The first, in a livery stable, has worked successfully over two years. It is claimed that with power cleaners two men can clean as many horses as six men could by hand, and do the work much better. The horses are said to enjoy the performance, and stand quieter for it than for hand cleaning. The installation was made by H. O. Woodruff, the local motor agent.

Automatic Electric Valve Controller.

There are many situations in which it is desirable to stop the action of engines or machines at definite times automatically, and many devices have been invented for this purpose, among which are several electrical ones. Recently, however, still another of the latter class has been brought out, which possesses a decidedly novel feature. In this apparatus, which is shown in perspective in Fig. 1, and diagramatically in Fig. 2, it will be noticed that the electro-magnet employed, instead of, as heretofore, attracting the armature which directly releases a catch upon the closing of the circuit, is replaced by a vibrator set in action by the electro-magnet, the blows of which release

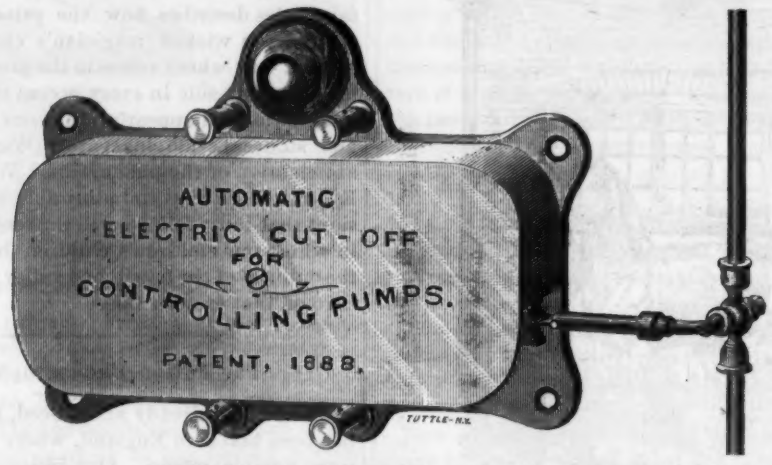


FIG. 1.—AUTOMATIC ELECTRIC VALVE CONTROLLER.

e catch and permit of the shutting off of the power.

By referring to the illustration, Fig. 2, it will be seen that the valve has a lever and weight attached to it, which is maintained in position by the catch *D*, which is held by the pawl *E*. The other side of the pawl is placed in line with the vibrator *F* of the electro-magnet *G*. Thus when the circuit is closed, by the rising of a float in a tank, for instance, the vibrator *F* strikes the pawl *E*, which releases the catch and allows the lever *C* to be pulled down by the weight attached to it, and thus shuts off the supply of steam or gas or other working pressure, as the case may be.

The power obtained even from a single battery by the medium of the blows struck by the vibrator *F* is quite considerable and sufficient to release the pawl, even though the weight upon the lever *C* be very heavy, such as would be required to control a large valve.

Such a device, in connection with another for opening the valve at the proper time, has been in operation at the Petroleum Exchange building in this city for some time, with very satisfactory results, and also in several residences where it controls the supply of gas in gas engines which pump water to tanks on the roof. This apparatus, which is the invention of Mr. G. S. Neu, is manufactured by the Electric Power Controller Company, of this city.

The Heath Patent Self-Timing Speed Indicator.

We illustrate on this page an indicator which is intended to be self-timing, self-registering and adapted to taking the highest as well as the lowest velocities. This object is attained by means of three distinct mechanisms combinable at the will of the operator, as follows:

1st. The transmitting device consists of the detatchable point shown at the lower left of the cut. This point is lance shape at one end, and is provided with a socket at the other. Two strong pinions running together and each having a projecting shank fit the point socket, so that a shaft running in either direction may be timed by attaching the point to the corresponding pinion. A pinion box holds these parts in proper relation to each other and with the body of the instrument.

2d. The counting and registering apparatus consists of a worm and gear, with which are connected the hands, each being provided with a heart cam, as in the case of a "fly-back" watch. There are also the necessary motion wheels and pinions to secure the proper relative motion of the hands.

3d. The time mechanism includes a strong lever escapement absolutely non-magnetic, which is operated by a spring attached to the axis of a power wheel, and this receives the same impulse whether the speed is high or low. The parts of the instrument are held between plates in a manner similar to those of a watch and are inclosed in a neat and substantial case.

In using the indicator, shown full size in the cut, the setting pin *A* is firmly pressed inward until it stops, which sets the hands at 0 and winds the power spring. Then the point being attached, as in the cut, or in case the shaft runs in the direction followed by the hands of a clock, to the upper pinion, the point is placed in the centre of the shaft to be timed, brought as nearly as possible in line with it, and held with enough firmness to prevent slipping.

The starting pin *B* is then pressed firmly inward and released; this starts the hands and at the same time releases the time train. The instrument must now be held steadily in place until the hands stop, when the rate of speed may be read on the dial, the outer graduated circle indicating revolutions and the inner one hundreds of revolutions.

These instruments are manufactured by the Eddy Electric Manufacturing Company of Windsor, Conn.

On Electrolysis by the Alternating Currents of Dynamo Machines *

BY MM. G. MANEUVRIER AND J. CHAPPUIS.

If the alternating currents of a dynamo are passed into an ordinary voltameter containing water acidulated with pure sulphuric acid, and having plates of thick wires of

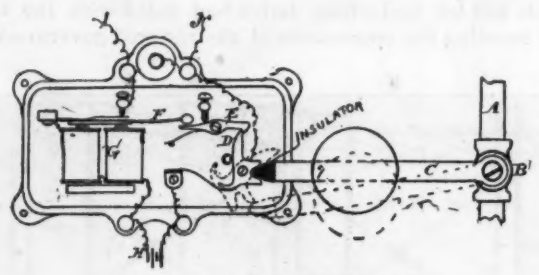


FIG. 2.—VALVE CONTROLLER.

platinum, no liberation of gas is generally observed at the electrodes. It seems as if there was no decomposition of the acidulated water, though the circulation of the currents is perfectly established. For instance, with currents of 250–300 volts, and of 4–5 ampères, which would easily supply a system of lighting, whether by arc or glow-lamps, we do not even perceive traces of gases at the electrodes, provided that their dimensions exceed 0.1 centimetre in diameter and 4 or 5 centimetres in len gth.

This is the explanation of the common opinion that the alternating currents of dynamos are no more capable of decomposing the acidulated water of a voltameter than of deflecting the needle of a galvanometer. But this opinion is erroneous. Their incapacity for electrolysis is only apparent, for if in one and the same voltameter we substitute very fine wires for the broad electrodes, the same alternating currents produce immediately an abundant escape of gas.

The experimental study of this phenomenon leads to the following conclusions:

1. For currents of a given intensity there exists a platinum electrode of such a surface that the gases are not liberated, and that the electrolysis is, or seems to be, completely arrested. If we then gradually diminish the surface of such an electrode by reducing either its length or its diameter, the escape of gases appears, and is the more abundant the greater the electrodes have been reduced in a greater extent.

2. Inversely, for platinum electrodes of given dimensions there exists an intensity of current below which there is no development of gas ; the decomposition is produced on the contrary, at an intensity above this limit, and it increases with such intensity.

3. In all cases chemical analysis proves that the gases collected at each electrode have the same composition. They are the gases of water, forming a detonating mixture, but with a proportion of oxygen below one-third of the total volume. Moreover the volume of this detonating gas per ampère and per minute is always more or less than the theoretical quantity, 10.4 cc., which would be given off under the same conditions by a continuous current.

One of the most interesting circumstances connected with this electrolysis is that ozone is produced at each electrode, in spite of the presence of hydrogen. If we allow the gases to escape freely into the air, this ozone is manifest to the sense of smell by its strong odor, and the characteristic white fumes are visible. We have determined their proportions, which are variable at one and the same temperature according to the density of the current—the chief factor of the phenomenon—and according to the nature of the electrodes and of the electrolyte. But we wish at present to speak only of the fact of its production, which plays an important part in the interpretation of the phenomena above mentioned.

It seems natural that if we have at one and the same electrode the simultaneous production of strongly ozonized oxygen and of nascent hydrogen, the slightest external influence will suffice to effect the reconstitution of water at this electrode, and in consequence the disappearance or the reabsorption of the gases. In the case of platinum electrodes this determining external cause is precisely the condensing power of the metal, which is exerted in proportion to to the metallic surface in contact with the gases, whence results an admissible explanation of the three foregoing phenomena.

This view is confirmed by several of our experiments, of which we cite two :

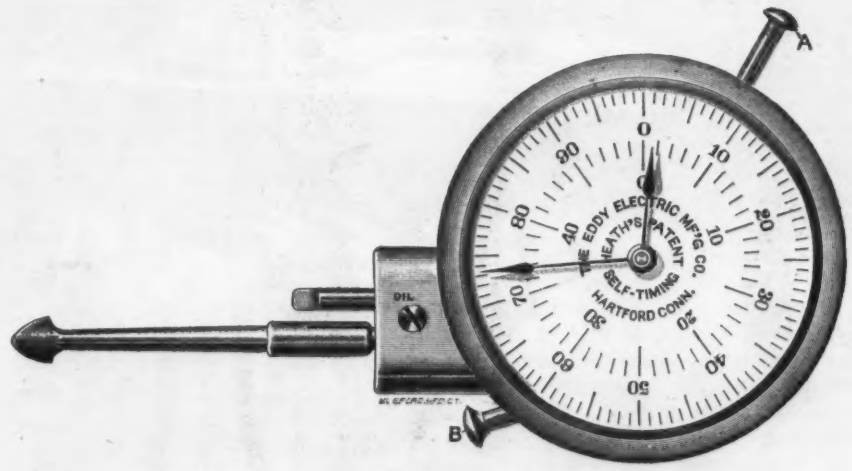
1. Copper electrodes do not decompose acidulated water under the same conditions of density of current in which it is still decomposed by platinum electrodes. They become covered, however, with a layer of red reduced copper, and if we then substitute for them much finer copper wires, there is produced an abundant escape of gas. But it does not last long, since these electrodes become, so to speak, dissolved in the liquid in the form of threads of pulverulent red reduced copper.

The copper, therefore, is first oxidized by the ozonized oxygen, and reduced again by the hydrogen with recomposition of the water. It is plain that if the surface available for this reaction is sufficient, there cannot escape the least bubble of gas. Here, therefore, we have reabsorption of the gases of the water, and the external determining cause is a double chemical reaction.

2. With electrodes of mercury of a large surface gas is evolved in small quantities, and there is produced at the same time a cloud of white matter which gradually pervades the voltameter. This gas consists almost entirely of hydrogen, whilst the solid matter is mercurous sulphate, a very sparingly soluble salt. But under the same conditions the transit of a continuous current produces exclusively mercuric sulphate. Here again, therefore, we have a re-constitution of the water at the expense of the gases which would have been evolved, and the cause determining their re-combination lies at once in the absorbing power of mercury for gases, and in the double reaction undergone by the metal and the mercuric sulphate.

These secondary reactions explain at the same time the discrepancy mentioned above as occurring between the volumes of gases collected at any given intensity of the alternating currents and the theoretical volumes deduced from the law of Faraday. Still we shall show that by means of a suitable choice of the electrolyte and of the electrodes we may effect, directly or indirectly, reactions whose products are strictly proportional to the total quantity of electricity which has passed through the electrolyte. We shall thus have a voltametric method for measuring the differential of time and current (disregarding the sign), and the electrolytic apparatus thus produced will form an integrator or counter of elect ricity for alternating currents.

* *Comptes Rendus.*



A SELF-TIMING SPEED INDICATOR.

These two experiments prove how far the reactions, direct or secondary, of electrolysis by alternating currents, differ from the reactions of ordinary electrolysis by continuous currents; we have observed many other instances which we shall make known at an early date.

It must be added that the escape of detonating gas renders these electrolytic researches delicate and even dangerous. There is perpetual risk of spontaneous detonations unless we take, in collecting the gases, certain precautions which will be indicated in an early communication.

A New Ampere Standard.

On account of the large dimensions and the great care necessary in its construction the absolute electro-dynamometric balance is a costly apparatus. In order to avoid this M. H. Pellat has had recently constructed for him by M. J. Carpentier, an apparatus similar to the absolute electro-dynamometer, but of smaller dimensions and less costly, which be has called the ampère-standard. This instrument, once calibrated by comparison with the absolute instrument, can render exactly the same services as the latter. The accompanying engraving shows the arrangement of the new apparatus. Calling C the strength of current, M the mass in grammes which produces equilibrium, g the acceleration due to gravity at the point where the measurement is taken, and A a constant depending upon the construction, we have:

$$C = A\sqrt{Mg},$$
$$C = B\sqrt{M},$$

whence, $$B = A\sqrt{g}.$$

We obtain thus the current C, by a simple determination of the mass M, put in the scale plan in order to balance the dynamometric couple.

In the apparatus, as constructed, a current of 0 3 ampère is balanced by a weight of 1.5 gramme. If the direction of the current is reversed in the large coils in order to eliminate the action of terrestrial magnetism, the difference of the two weights will be about 3 grammes.

An error of .5 milligramme would introduce an error of only $\frac{1}{12{,}000}$ in the value of C, and the balance is sensitive to .1 milligramme. The error of the absolute strength of the measured currents will be the same as that of the absolute electro-dynamometer, that is, $\frac{1}{2{,}000}$ at the utmost, or an error less than that existing in the resistance, the ohm being only known within $\frac{1}{800}$ of its true value.

The principal applications of the ampère-standard are: 1. The standardizing of apparatus designed for measuring the strength of a current. 2. Determination of the electromotive force of batteries. 3. The determination of the horizontal component of the earth's magnetism, which is accomplished by passing the same current in the ampère-standard and in the coils of a tangent galvanometer, the constant of which is known.—*L'Electricien.*

A New Inductometer.

The well-known action of a magnetic field on a column of mercury through which a current is passing has been recently utilized by M. George Miot, of Paris, in the construction of an "inductometer," or instrument for determining the strength of the magnetic field. The effect of the magnetic field, it will be remembered, is to cause the mercury to rise, depending upon the strength of the current, or of the magnetic field when the current is constant.

The inductometer is shown in the accompanying engraving, Fig. 1, and Figs. 2 and 3 show respectively sections on the lines 1 2 and 3 4.

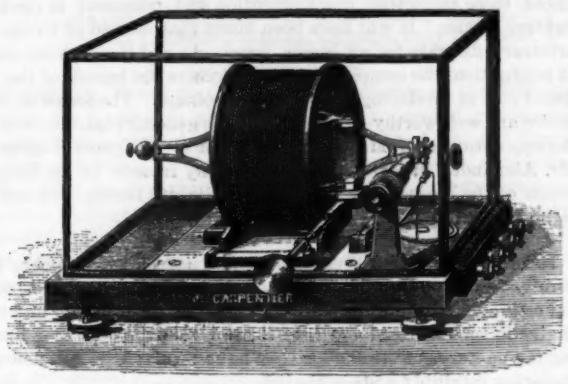
The apparatus consists, essentially, of a tube $A\ B\ C$, the lower portion of which is flattened in such a way that it can be placed in a short magnetic field, such as found in dynamo-electric machines. To the base B is soldered a capillary tube D, which is surmounted by a bulb E, above which rises a graduated tube F. Two other bulbs $G\ G'$ are placed upon the extremities of the U-shaped tube, and are provided with branch tubes $g\ g'$, into which the mercury is poured until its level reaches to about the middle of the three bulbs. Then on top of the mercury are poured several drops of glycerine into the bulbs $G\ G'$, and a few drops of water or alcohol into the tube F.

In order to preserve the mercury and other liquid from contact with the air, the U-shaped tube is prolonged above the two bulbs to unite again with the central tube at the top of the apparatus, as shown in Fig. 1. In this way the liquids are inclosed in an atmospere of their own, having no communication with the external air.

In order to measure the intensity of the magnetic field by this apparatus, metal rods $H\ H'$ are introduced through the tubular branches $g\ g'$ into the bulbs $G\ G'$, so that their ends are immersed in the mercury. The rods $H\ H'$ are then connected with the poles of a generator, and the part B of the tube is placed in the magnetic field to be examined and with the tubes B and D at right angles to the line of magnetic force. The mercury will immediately rise in the bulb E and force up the liquid therein, which may be colored, into the tube F. The diameter of the latter being much smaller than that of the bulb, the movements of the liquid therein are correspondingly amplified.

Referring to Fig. 4, if it is desired to measure at the point a the intensity of the field of a magnet-pole Z, it suffices to place at a the part of the apparatus representing the intersection of the horizontal tube B with the middle tube D, to pass through the tube B a known current of, say, from one to ten ampères, and to read the change of level produced in the column of colored liquid in the tube F. If d represents this height read on the scale F, and C be the current traversing the apparatus at a, then the magnetic force H at that point will be represented by $\frac{d}{KC}$, K being the constant of the instrument.

The rise of the mercury is due to the magnetic force acting on the electric current traversing the tube B, which



A NEW AMPERE STANDARD.

is the same as a magnetic field exerts on any electric current placed therein.

For the examination of a vertical field it suffices to curve the lower part of the tube at right angles.

About Electrical Books.

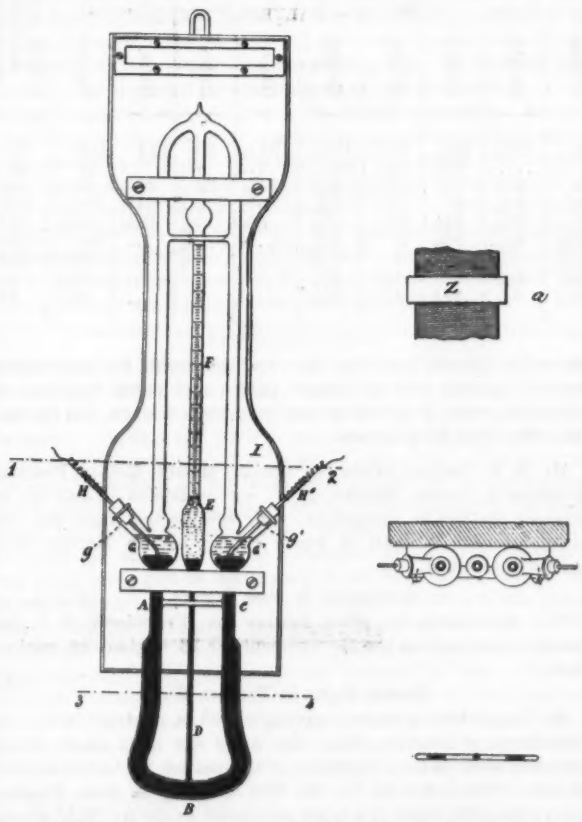
Since the publication in these columns of Mr. T. D. Lockwood's admirable paper on "What Shall We Read?" THE ELECTRICAL WORLD office has received a large number of communications asking where the books Mr. Lockwood recommends may be purchased, and inquiring whether we can supply copies.

Here is a sample of the letters:

BETHLEHEM, Pa., July 26th, 1888.

W. J. Johnston, Publisher, 168-177 Potter Building, New York.

DEAR SIR: Having read in the columns of THE ELECTRICAL WORLD of July 23 and 30 a communication entitled "What Shall We Read?" by Lockwood, I noticed



FIGS. 1, 2, 3 and 4.—A NEW INDUCTOMETER.

several books there mentioned which I am very anxious of securing, as myself and two others intend taking up this study, and propose buying these books from you, if you have them for sale. If not, can you inform me where I can purchase them? If for sale by you, I should like very much to have you send me a descriptive catalogue, giving list of books mentioned in the WORLD, or any others interesting to electrical novices, with prices, etc.

Yours respectfully, RICHARD FOLEY.

Considering the fact that the book department of THE ELECTRICAL WORLD has been in existence for something like a decade; and considering the further fact that there is no work on electrical subjects that we do not publish or at least sell, we have been in the habit of assuming that readers of THE ELECTRICAL WORLD knew that they can always send to us for any electrical book in the market, with the assurance of receiving it by return mail, postage prepaid, at publisher's price. If there are any other readers, however, who have not been aware of this, we shall be pleased to mail them a copy of our new Catalogue of Electrical Books, just issued, and revised to date.

Electrolysis by Means of the Alternating Current.

M. Neyreneuf, writing in the *Journal de Physique*, describes some results of a remarkable character obtained by the use of aluminium electrodes. In a voltameter of this description filled with dilute acid and traversed by an alternating current, the author finds that pure hydrogen is evolved at both electrodes. What becomes of the oxygen we are not told. When, however, one electrode is of aluminium and the other of mercury, and the liquid is distilled water, much more extraordinary results ensue. *The current passes in one direction only*, and the arrangement forms what the author calls an electric valve. The current which gets through is, moreover, in the reverse direction to that which would be due to the mercury-aluminium couple itself. Furthermore, the addition of some drops of acid to the distilled water notably *diminishes* the current. The aluminium may be replaced by other metals with results of the same general character, but the apparent resistance of the cell is much greater. Nickel and zinc cause the current to pass in the reverse direction.

Morse on the Cables.

To the Editor of the Electrical World:

SIR: Referring to the account in your paper of June 9 of a test made with my cable transmitter, I wish to add a few explanatory details. The cable over which the unprepared test was made is 840 knots, 13,000 ohms resistance and 240 microfarads capacity. Ordinarily this cable is worked with 15 cells of Fuller battery—about 30 volts. With my transmitter this battery was divided in the middle, giving about 15 volts on each reversal. The speed obtained was 340 complete reversals, or 680 alternating impulses per minute. The strip shows 14 alternating impulses to the inch, and a perfectly uniform undulation of a thirty-second of an inch. No effort was made to ascertain the limit of speed, as on account of lack of battery facilities it was not expected that any satisfactory results could be obtained. PATRICK B. DELANY.

Clark Standard Cells.

To the Editor of The Electrical World:

SIR: Referring to the Clark standard cells described in the article contained in your issue of June 23, a set was mentioned, which I prepared last January for the Edison Laboratory, as not having differed among themselves more than two parts in 8,000, or 0.025 per cent. As a matter of interest, to show the agreement possible between cells set up by different persons, I quote from a published letter by Mr. Kennelly in regard to them, as follows:

"The difference between the E. M. F. of the Newark and London (Dr. Alex. Muirhead) cells is within 0.0004 volt, or 0.028 per cent., all at the same temperature; and the mean difference is about 0.00025 volt excess on the side of the London cells."

In the letter referred to it was erroneously stated that these cells were prepared elsewhere than in my laboratory, which statement, as a matter of simple justice I wish to correct. DURAND WOODMAN, Ph. D.

NEWARK, N. J.

E. M. F. at Different Spark Lengths.

To the Editor of the Electrical World:

SIR: I have an induction coil for producing sparks up to 4 inches in length. How can I ascertain the E M. F. of the above sparks from the length or distance they jump across? D. T.

FORT WAYNE, Ind.

ANSWER.—There is no instrument by which the E. M. F. of such a spark can be directly determined, and it is difficult even to estimate it within reasonable limits. In experiments made by Sir Wm. Thomson and Mr. De La Rue, the former with the electrometer and the latter with a chloride of silver battery, the greatest spark length obtained was 0.08275 inch, which corresponded to 8,040 chloride of silver cells, or to about 8,500 volts. Hence, assuming for the moment that the E. M. F. per unit length is equal for all spark lengths, the E. M. F. necessary to produce a 4-inch spark would be about 400,000 volts. But the E. M. F. per unit length diminishes with the increase in spark length, so that the exact proportion above given would not hold true. The exact law of this decrease has not yet been determined, but it is probable that, in taking this factor into account a spark of 4-inch length would require an E. M. F. of between 200,000 and 300,000 volts.—EDS. E. W.

Control of High Tension Currents.

To the Editor of the Electrical World:

SIR: The debate now going forward before the Board of Electrical Control of New York is of extreme interest to all electrical engineers, and no one can deny that some points brought forward against high tension currents are well taken. For instance, no one can oppose the fact that a high tension circuit, no matter how harmless in its normal condition, is, when grounded, an element of extreme danger; and inasmuch as there has been recently placed upon the market apparatus which will absolutely remove all grounded portions from the main cir-

cuit instantaneously, and even before they have fully developed, why should not the Board of Electrical Control "control" these matters as Mr. Peck suggests, and insist upon the use of these devices, which will render all of these circuits absolutely harmless? This device above referred to is equally applicable to the direct and alternating current systems, and new proofs of its wide range of applicability are constantly developing.

THE ELECTRICAL SUPPLY CO.,
CHICAGO, July 27. F. S. TERRY, Manager.

Special Correspondence.

NEW YORK NOTES.

OFFICE OF THE ELECTRICAL WORLD,
168-177 POTTER BUILDING, NEW YORK, July 30, 1888.

The Overhead Wire Agitation.

The first case against the United States Illuminating Company for maintaining poles and wires against the order of the Board of Electrical Control, has been taken out of the police courts and sent to the grand jury, a course which seems to suit both parties. Another case has, however, for some reason been taken before the Jefferson Market Court.

Police Signaling Apparatus.

The Board of Estimate and Apportionment considered last week the award of the contract for police signaling apparatus to the Herzog Teleseme Company by the Police Board. Col. George Bliss appeared on behalf of John Stetson and the Gamewell Fire Alarm Telegraph Company. Col. Bliss asserted that the contract to the Herzog Company had not been awarded under fair conditions. Mr. Herzog said that his company had been fairly given the contract, and was ready to provide just what was desired by the Police Department. The matter was finally, at the suggestion of the Mayor, referred to the Police Commissioners, with the request that they hear all complaints on the subject of their action.

Suits on Combination Fixtures.

I hear from Mr. Luther Stieringer that the suits against Mitchell, Vance & Co. on the Stieringer patents, which are claimed by him to cover very broadly some of the leading details in electric and combination fixtures, and which have been allowed to lie dormant of late, have been taken up again and will be brought to trial this fall. The interests affected are large.

The Callender Insulating and Waterproofing Company.

Mr. W. M. Callender has been elected to the presidency of the Callender Company. He reports an excellent state of business in all their departments, such as underground wires and cables, Trinidad line wire, flexible cords and cables, &c. They have been compelled to run their works night and day, and will shortly increase their capacity to meet the demand for their various specialties. Mr. Callender, who returned from England not long since, and is thoroughly informed on the situation over there, tells me, by the way, that the prospects for electric lighting are decidedly improving, legislation being more favorable, and the feeling of capitalists and investors being far more hearty and hopeful.

Underground Work.

The National Conduit Manufacturing Company, of 18 Cortlandt street, is laying some 60,000 feet of its cement-lined wrought-iron pipe in Lexington avenue, and will also lay 150,000 feet in Twenty-third street. It is laying 15,000 feet in Chicago, for the city, under the supervision of Prof. Barrett, the city's electrician. The section that has been in use in the New York subways for over one year is reported to be in exceedingly good condition.

Standard Underground Cable Company.

Mr. G. L. Wiley, the Eastern manager for the Standard Company, showed me, on dropping into his office last week, an order just received for 85,000 feet of Waring anti-induction cables, No. 14 B. & S., for the fire department of Buffalo, N. Y., for underground service. The company is to lay this cable immediately.

The Electrical Accumulator Company.

A very handsome and effective pamphlet has been issued by the above company illustrating its work and its well-known storage batteries, and giving details as to the work in general, as well as citing a large number of testimonials. I think the following data as to the company's cells will be of interest. The E. M. F. for each cell is about 2 volts.

The Ide Automatic Engine.

Messrs. Fleming & Kimball have opened offices at 17 Dey street, as Eastern representatives of the Ide automatic and plain slide-valve engines for electric light and general use. They also carry steam supplies and specialties, and are contractors for complete electric lighting equipments.

Delany's Bulletin Board.

I hear some very favorable comments on the electrical bulletin board devised by Mr. P. B. Delany, and described in your last issue. The field for such an apparatus is undoubtedly a large one. I might mention that the board can now be seen in operation at Mr. Delany's office and laboratory, 84 Broad street.

The Schenck Belt-Holder and Shifter Company.

The partnership of Willis & Schenck, agents, 93 Liberty street, has been dissolved and an incorporated company with a capital of $25,000 has been formed under the laws of New York. The management is now in strong hands and the facilities required by the increased demand will be promptly secured. Highly favorable reports from their numerous belt-holders and shifters now in use are being constantly received, and the business bids fair to make a stir in the mechanical world. The low cost and its perfect working make it desirable in electric light plants and other places with fast running machinery.

The Sawyer-Man Company.

I find the late announcement of the Sawyer-Man Company in regard to its new lamp lists and the innovations thereby introduced to be attracting much attention and comment in electric lighting circles. It will have been noted that instead of fixing an arbitrary flat rate for all lamps, irrespective of the varying costs of production, the company gives customers the benefit of the reduced cost of producing lamps of low voltage. The terms of the notice are well worthy of study. There is general pleasure, too, at the appointment of Mr. P. H. Alexander to the general agency. Mr. Alexander has won and holds many friends in all departments of the business, and we can now dispute Boston's exclusive claim to him.

Williams & Potter.

The above firm, of 2 West Fourteenth street, representing the Straight Line engine, are greatly pressed filling orders and making estimates for lighting plants. They are gratified to find the engine in such demand and esteem, and take pleasure in exhibiting the numerous testimonials they have received. Each new installation infallibly adds to the list.

W. T. H.

NEW ENGLAND NOTES.

BRANCH OFFICE OF THE ELECTRICAL WORLD,
178 Devonshire Street, Boston, July 30, 1888.

Personals.

Mr. Fred. Angell, the traveling representative of Messrs Roebling & Sons, of Trenton, N. J., wire manufacturers, favored this office with a visit last week.

Mr. C. H. Guild, of Providence, R. I., is now associated with Mr. H. C. Spaulding in promoting the motor interests of the Thomson-Houston Electric Company in Eastern and Northern New England.

Mr. David E. Evans, of Baltimore, Md., general superintendent of the Brush Electric Company of that city, was in Boston last week in the interests of the company named. Mr. Evans gave me a pleasant call although he was pressed for time.

Mr. D. B. Smith, of Honolulu, Hawaii, the representative of the Thomson-Houston International Electric Company in the Hawaiian Islands, and who deserves the credit for introducing electric lighting into the king's palace and public buildings of Honolulu, was on a visit to this country last week, and favored this office with his presence.

Mr. B. F. Pearson, of the law firm of Messrs. McCoy, Pearson, Morrison & Forbes, Halifax, N. S., was in Boston on July 26, on business matters in connection with the electric light and telephone interests, in both of which enterprises (in Halifax) he is actively identified.

Armington & Sims Engines.

The Armington & Sims Engine Co., Providence, R. I., has received orders from the Government for 16 engines of various sizes.

Electric Lights for Danvers, Mass.

Mr. Frank Ridlon reports having closed a contract with the Selectmen of Danvers, Mass., for a 70 arc light plant (Brush system); work on the foundation of the station to be commenced at once. This is said to be the first instance in New England where the authorities of a town purchased an electric light plant.

Another Wire Factory.

I have just learned from an authentic source that the Benedict & Burnham Manufacturing Company, of Waterbury, Conn., has purchased property in North Adams, Mass., and intends to establish there a branch of its wire manufacturing department.

Sprague Motors in Boston.

The New England agency of the Sprague Electric Railway and Motor Company, under Messrs. Sawyer and Blake, report the following sales in Boston during the past few weeks: Boston Photogravure Company, 1 h. p. to run large cylinder copying press; Wm. Kellaway, 3 h. p. to run a printing office; Notman Photo. Company, ¼ h. p. to run a burnishing machine; Alles & Fisher, 1 h. p. to run cigar-making machines, saving 75 per cent. over hand labor; Osgood & Flagg, ½ h. p. to run dentist machinery; Abram Fernoh & Co., 10 h. p. to run elevator; Great Atlantic & Pacific Tea Company, 1 h. p. to run coffee mill and printing press; J. T. Ghries & Co., 7½ h. p. to run coffee roasters and mill and elevator; M. T. Duval & Son, 1 h. p. to run sewing machines; George H. Lovejoy, 1 h. p. to run sewing machines; Lyman & White, 10 h. p. to run printing office and sewing machines; C. W. Calkins & Co., 7½ h. p. to run printing office and elevator; Open Board Stock Exchange, ½ h. p. to run ventilating fan.

West End Street Railway.

New evidence presents itself daily in Boston to prove that the West End Street Railway Company is putting forth active efforts to get electric motors in practical operation on its suburban line at as early a day as possible. The company has awarded the Jarvis Engineering Company the contract for the building and equipping of the first steam plant for the electric railway department of the former.

A Novel Experiment in Tricycling.

Several mornings during last week in Boston, before vehicles and street cars began to occupy Columbus avenue, an early pedestrian would have noticed and been astonished to see a machine moving along with lightning-like rapidity without evidence of human aid as its propelling agency. It was simply a tricycle equipped with a small electric motor and two accumulator cells undergoing a series of experiments. The tricycle thus operated gave satisfaction to the experimenters as regards speed attained.

Re-election of Jarvis Company's Officers.

The stockholders of the Jarvis Engineering Company held their annual meeting at the Boston office of the company on Saturday and Tuesday, July 21 and 24, respectively. The entire personnel will remain unchanged, the old board having been unanimously re-elected, viz.: K. M. Jarvis, president; J. N. Pratt, treasurer and general manager; and F. A. Crawford, secretary. The board of directors will consist of the same gentlemen as during the year previous, with one exception, Mr. H. L. Grant being elected to fill the vacancy created by the death of the late Mr. A. F. Upton. The board comprises the following named gentlemen: K. M. Jarvis, J. N. Pratt, C. A. Breton, H. A. Glasier and H. L. Grant. The meeting was a most satisfactory one in every particular to the stockholders.

After the meeting adjourned the majority of those present proceeded to India Wharf, where they embarked on a steamer, and participated in an enjoyable sail down the harbor, which was supplemented by a fish dinner at Tafts.

New England Electric Exchange.

As evidence of this organization now being actively at work issuing licenses, Col. E. H. Hewins, of the N. E. Weston Electric Light Company, informs me that he has received No. 1 of the several licenses issued by the Exchange. I have been informed also that it is the intention of the Board of Examiners of the Exchange to hold a weekly meeting hereafter at the rooms of the Boston Electric Club, No. 66 Boylston street.

Edison Lights for Ludlow, Mass.

After a thorough trial and test of the Edison system for a period of more than a year, the Ludlow Manufacturing Company, of Ludlow, Mass., has awarded to Messrs. Paine & Francis the contract for a 300 light Edison machine, to be installed at once in the company's new mill. The New England Wiring and Construction Company, of Boston, will attend to the construction work.

Another Local Accumulator Company.

A local company is being organized in Boston for the purpose of pushing the sale of Julien storage batteries in the New England States. It is reported that the offices of the company will be located at No. 28 State street. The company, it is said, will be composed of wealthy and enterprising business men.

An Isolated Plant Increased.

A six hundred light incandescent plant was installed upward of a year ago at the Boot Cotton Mills, Lowell, Mass., by the New England Weston Electric Light Company, and so well pleased are the mill owners with the performance of the electrics that an additional order has been given to the same company. The original plant was 600 16 c.p. incandescents, United States system; the increase will bring the lighting capacity up to 1,200 lights.

Ide Engines.

Messrs. John Post, Jr., & Co. have taken orders for placing two Ide engines of 75 h. p. each, one to be added to the steam plant equipment of the New Britain, Conn., Electric Light Company and the other for the isolated electric light plant in the factory of the Plympton Manufacturing Company, Hartford, Conn.

The Waterhouse System in Demand.

The Whitin Machine Company, Whitinsville, Mass., is so well pleased with the Waterhouse arc light plant purchased last season that it has placed an additional order for 135 arc lights with the Waterhouse Electric and Manufacturing Company, of Hartford, Conn., making a total of 170 arcs for lighting the former's large factories.

Rutland, Vt.

At the annual meeting last week of the Rutland Electric Light Company the following directors were elected: A. G. Gray, C. E. Ross, M. J. Francisco, B. F. Pollard, H. W. Cheny, W. H. Vallequill, A. C. Bates, F. H. Richardson, A. H. Abraham, H. O. Edson and J. A. Gould. The directors organized by electing M. J. Francisco president, H. W. Cheny vice-president, C. E. Ross treasurer, and I. H. Francisco secretary. The company are now running 135 arc lights, 2,000 c. p., Thomson-Houston system, and 300 incandescents, Edison, and have just put in a 125 h. p. boiler and a 100 h. p. engine, and entirely refitted their station.

W. I. B.

PHILADELPHIA NOTES.

BRANCH OFFICE OF THE ELECTRICAL WORLD,
39 South Tenth Street, Philadelphia, Pa., July 28, 1888.

The Edison Company.

The Edison Electric Light Company have announced that they are now putting in services and house connections from the Delaware to the Schuylkill River, and from Walnut to Arch streets, which covers the business portion and the most profitable electric light section of this city. The applications for lights will be filed in the order in which they come in, and will receive attention in the same order. There is no doubt that by the time the magnificent and costly Edison station on Sansom street is completed

TYPE OF CELLS	Charging current		Working rate and capacity.				External dimensions of jars.						Weight of acid.		Weight of complete cell.		Height over all, including connections.
			Normal.		Maximum.		Glass.			Rubber.							
	Normal.	Maximum.	Rate.	Ampère hours.	Rate.	Ampère hours.	Length.	Width.	Height.	Length.	Width.	Height.	Glass.	Rubber.	Glass.	Rubber.	
15 A	30	40	30	300	40	250	11½	9	13⅜	12½	9¾	13¾	31¼	19	121	120	21
7 B	13	18	13	150	20	120	.....	.....	.....	8⅞	3¾	13 7/16	.....	8½	.....	51	21
23 C	22	30	25	150	30	110	8¼	8	9⅝	7⅞	7⅞	9 3/16	14¼	12	49¾	42¾	13¾
15 C	15	20	15	100	20	70	5 13/16	8	9⅝	5	7 9/16	9 5/32	9¾	7½	34¾	27⅞	13½
7 C	6	9	6	45	9	30	3 7/16	8	9⅝	2 11/16	7½	9⅞	5¼	3¾	19¼	13 11/16	13½
41 D	20	30	20	90	30	80	10⅝	5⅝	6 7/16	9⅞	5	6 3/32	.....	7½	.....	32	10¼
21 D	10	15	10	45	15	40	6 1/16	5⅝	6 7/16	5 5/16	5	6 7/32	.....	3¾	.....	16¾	10⅛
11 D	5	7	5	23	8	20	3 1/16	5⅛	6 5/16	3	4 15/16	6 3/16	.....	2	.....	8½	9
5 D	2	3	2	9	3	8	2⅛	5⅛	6 5/16	1 11/16	4 15/16	6 3/16	.....	1	.....	4⅛	8¼

which will probably be before Oct. 1, the company will find itself crowded with orders.

Western Union City Fees.

The Western Union Telegraph Company appealed to the United States Circuit Court the suit of the city against it for $13,035 license fees on telegraph poles. This is done on the ground that the business carried on in this city is commerce between the different States and that the poles and wires upon which the city has charged license are instruments of commerce. The affidavit of the defense claims that the ordinance fixing the license is illegal for the reasons that the tax amounts to five times the cost of supervising them, that the license fee charged is a tax because it is assessed as a means of revenue to the city, that the charge is almost one-tenth of the value of the property upon which it is levied and is much greater proportionately than imposed upon other property, and that the company has already paid tax upon its poles and wires to the State.

Workshop Lighting.

William A. Doty, who is doing a large business in gas lighting keys, bells, etc., has been obliged to keep his workshop running at night, and in order to make the work as comfortable as possible for his employés during the heated term he has put in a 15-light dynamo, which gives sufficient light for the entire floor.

Atlantic City, N. J.

The members of the City Council of Atlantic City, N. J., were in this city last week investigating the storage battery street car service on the Lombard and South street line. They also took a look at the establishment of the Wharton Company. These cars will probably be used by the projected Atlantic City street railway.

Easton, Pa., Electric Railway.

A dispatch from Easton, Pa., says: "A big force of men worked last night, and early this morning had the Traction Electric Railroad ready for travel. At 8 o'clock fifty-five people boarded the first car to make the first trip over the line through Third street. They cheered all along the route, and their shouts were responded to by several hundred people, who lined the sidewalk to witness the event. Nothing has attracted so much attention in this city in many years as the running of this road through Third street. A property owner on that street, who is put down as one of the "kickers," said this morning that the fight against the road will be continued in all the higher courts.

Engines for Electric Lighting.

The Taylor Manufacturing Company, of Chambersburg, Pa., report the following steam plants, with Beck automatic engines, as in process of construction for electric light service: Complete steam plant of four Beck engines and four boilers, aggregating 400 h. p., to Fort Wayne Jenney Company, for installation at Dallas, Tex.; complete steam plant, 3 engines and 3 boilers, for Fort Worth, Texas; 67 h. p. steam plant for Gainesville, Tex.; also two 8½ by 10 Beck automatic engines to Central Trust Company, New York; two 9½ by 12 engines for Pontiac, Mich; one 12½ by 15 engine to go into the Gusky building, Pittsburgh; also another engine, same size, to Jones & Laughlin, Pittsburgh; one 15 by 18 engine to the Edison Company, of Birmingham, Ala., being the third engine of the Beck pattern that this company have operating in their station. The Taylor Manufacturing Company have just completed the installation of steam plant, two 9½ by 12 engines and boiler at Sea Isle City, N. J., operating an Edison station.

The Electrical Bureau.

The estimates for the maintenance of the Electrical Bureau, of the Department of Public Safety, for the year 1889, are placed at $116,850. The receipts from this department are estimated at $8,000.

Lighting a Sea Wall.

The entire sea wall at Sea Isle City, N. J., is now lit by Edison incandescent lights. Sea Isle is becoming a very popular summer resort, and the new light will add considerable to its natural beauty.

An Episode at Erie.

The following special dispatch appeared in one of the morning papers last week: Charles A. Lewis, a scientific person who has been organizing a company to manufacture electric lamps, fled the town to-day to escape the consequences which were likely to follow the forgery by him of the name of Hon. Orange Noble to several notes ranging from $25 to $50. Lewis, who was a soldier and Grand Army of the Republic man, and had served several years in the United States army as a musician, was the superintendent of the Erie electric light plant when it was established. He had invented a number of electric light and motor appliances. Last fall he launched a dramatic company with a play of his own writing. Lewis was seen in Buffalo to-day, and is most likely in Canada to-night.

Electricity and Rheumatism.

Electric light men are never troubled with rheumatism, says a local paper. The stiff jointed portion of humanity hover around the big dynamos in the Brush Light Company's works just the same as consumptives seek a slaughter-house for the blood of a freshly-killed bullock. "Why, people would be hanging around our dynamos all day if we permitted it," said Superintendent Law. The discussion upon the subject of electricity as a curative agent in certain chronic cases, notably rheumatism, has excited much interest among electricians and all classes of workmen engaged in handling heavily charged wires. Numerous cases are cited in different parts of the country to prove that men engaged in these employments are free from all rheumatic and neuralgic troubles. This appears to be the case in Philadelphia also.

Superintendent Law is ready to debate the question with the best informed doctor in the land. Eight years ago when he first began to work around dynamos in San Francisco he was afflicted with acute rheumatism. His fingers were hoisted out of all natural shape and proportion by the insidious disease, and the joints were swollen to many times their natural size. His shoulders, hips and knees were similarly affected, and he was, as he expresses it himself, so stiff that he could scarcely move. He soon began to improve, however, when he came into close contact with the dynamos, and although he was not cured immediately, his recovery was sure and rapid, and in less than eighteen months he was apparently a well man. He has had no recurrence of the trouble, and is convinced that the cure can be credited to nothing but the wonderful influence of the strong currents of electricity with which he has been constantly surrounded for years. Mr. Law speaks of a portion of his experience as rather in the nature of heroic treatment. He has been knocked down time out of mind by coming in contact, either through his own carelessness or by accident, with two wires, and upon one occasion remained unconscious for ten minutes. The shock upon that occasion, he says, felt to him as though he had been hit in the neck with a sand-bag. He was rather surprised to find himself still alive when he came to his senses. If life can be taken in that way, Mr. Law thinks it would be the most humane method of executing criminals. He suffered no pain at all from the shock except when he was burned, but he thinks it has effectually banished the rheumatism. E. W. E.

WESTERN NOTES.

BRANCH OFFICE OF THE ELECTRICAL WORLD,
44 Lakeside Building, Chicago, July 28, 1888.

The Williams Engine.

Fairbanks, Morse & Co., sole manufacturers of the Williams engine, are putting in another 500 h. p. compound condensing engine at the central station of the Chicago Arc Light and Power Company, it being the third one of the same pattern at this station. They are also putting in another of the compound condensing type at Edgewater for an Edision plant being installed by Leonard & Izard, of this city, agents for the Edison Company. The Edgewater plant, it is said, will be a model one in many respects when completed. The special feature of the Williams engine is in the valves, which admit steam very quickly, the ports having double openings. The wearing surfaces of the engine are made extra large, the object being to make the machine durable and at the same time economical in the use of steam.

Northwestern Electrical Accumulator Company,

Licensees for the Northwest of the Electrical Accumulator Company of New York, are out with a new catalogue giving views of the different departments of the factory, and a good amount of information regarding the storage battery in general. A large number of testimonials of users in this country and England are also given.

Messrs. Munson & Co.

report the sale of a large number of their special dynamo belts recently, and state that the outlook for the fall trade is very flattering.

The Excelsior Company.

Mr. F. W. Horne, manager of the Western department of the Excelsior Company, informs me that he has just contracted with John York to light his dry goods store on the west side with 60 arc and 50 incandescent lights. The Sawyer-Man incandescent lamp will be used.

The Western Electric Company.

Through the courtesy of Manager Brown I was last week given the opportunity to inspect the extensive works of the Western Electric Company. The new addition to the factory is completed, and a good portion of the machinery is in position. This will give them considerable much needed room. In every department activity was apparent. Some 750 people are employed in the factory, and I am informed that everything is running at its full capacity. The company are just out with a new catalogue, descriptive of their electric light system, giving testimonials and names of parties using the system throughout the country.

The company now have over 5,000 lights in operation. Besides their electric light system it is generally known that the company manufacture a large line of specialities in the way of bells, switchboards, telephones, etc., so that the "dull time of the season" is not known at this factory. The company have just been awarded a contract for 200 arc and 100 incandescent lights for lighting the coming exposition, to be held this fall, and which promises to be of unusual importance. A 600 equipment switch-board was also sold last week, which goes to Salt Lake City, Utah.

Accumulators in Use.

Mr. Paul W. Bossart, representing the Interstate Electric Company of this city, has just returned from a trip to Missouri Valley, Ia., where his company is putting in a battery of accumulators. He says the work is progressing finely, and that the plant will be in operation by the last of this week. The work on the central station of the company in this city is not making much headway. It is being put in the Keith and Perry building, which is in course of erection, and is being delayed itself, which accounts for the delay on the Interstate plant. The Interstate will put a battery of accumulators in at Fort Scott, where the Western Electrical Construction Company is putting in the plant, and the Thomson-Houston Company supplying the lights. The company has not yet succeeded in putting accumulators in the Independence, Mo., plant, all on account of one stubborn director who declares the accumulator system a fraud and yet refuses to investigate its workings. A short time ago one of his arguments was that the president of the accumulator company had told him that the system was of little or no value except in private or small plants. Mr. Bossart immediately wrote the president in the East, and received a reply stating that the Independence director had never met the president, that the latter had never heard of him before and that he had never made such a statement to anybody.

Underground Wires in Kansas City.

It is a sort of fad with municipal reformers and the Kansas City councilmen to prepare and pass ordinances providing for conduits, subways and underground passages for electrical wires. Heretofore it had always been a fad of the Mayor to veto them as rapidly as they were passed. It is still the policy, and always will be, for the electrical companies to oppose them, and to give numerous arguments why the ordinances should not be passed, or, if passed, should be vetoed. One conduit company is in existence here now, but franchiseless, and two conduit ordinances are pending before the council. The talk of reduced telephone rates has brought about again the discussion of the conduit question. Mayor Kempf now thinks it is high time something was being done in the matter. His idea is to have a committee investigate all the conduit systems in operation, and select the best for Kansas City. On the other hand, the electrical companies say the idea itself is an impracticable one, that no conduit can be more than a partial success, that it would cause an unnecessary and enormous expense, and that overhead wires are not as bad as they are represented, and there you are. That the telephone company has little fear of either proposition succeeding is evinced by the fact that it continues extending its cables, putting one into the new board of trade building last week, making 25 miles of 100-wire cable in the city, and before fall the cable will be five miles longer. Another big work of the company now progressing is the putting in of a copper wire circuit between the city and Topeka, Kan., a distance of 70 miles, requiring 140 miles of copper wire.

The New City Electric Light Plant.

I learn from Prof. J. P. Barrett, our city electrician, that the 500 h. p. engines for the new electric light plant, with station house, located on the corner of Van Buren and Des Plaines streets, will be in place within a few days. The conduits are being built, the work being pushed forward as fast as possible, and the Professor thinks that he will have a large number of lights in operation by fall. As originally planned, in the streets crossing the river, several lights will be located within a few blocks of the river. From Rush street bridge a system of street lamps will be extended down Michigan avenue to Madison street, and thence west to the Chicago River. As much of the area between Madison street and the river will be covered as possible. A west side system will start at Van Buren street bridge and run to Halsted street, thence north to Washington street and back to the river. On West Madison street, the lamps will be placed at proper intervals as far as Western avenue. All this territory, however, will not be lighted at once, as the appropriation of $35,000 will not be sufficient to make this plant, in reality but a small beginning for the city. The present plant has a capacity for about 450 lamps of 2000 c. p.

Special Lighting at Cincinnati.

The Cincinnati *Commercial* has the following about the Centennial: "Just north of the Tyler Davidson Fountain is now to be seen what is, all things considered, the handsomest and costliest display ever made in a decorative way on a public occasion by private enterprise in the West. At night it is one of the sights of the Exposition city in her Centennial year. Eleven tall arches of iron span North Fifth street from the foot of the Probasco Esplanade to the curbstone fronting Mabley & Carew's great establishment. They range along the entire frontage of the latter and are aglow with one thousand Edison incandescent lamps, so artistically arranged and colored that the effect is magical. No scene described in the Arabian Nights, no Oriental illumination could have equaled this arbor of light. The lamps range over each iron arch from ground to ground again. They stretch along the centre of the street leaping from the arch. From the central span rise mighty letters, reading 'C-e-n-t-e-n-n-i-a-l'—each letter three feet high and each a work of art—parti-colored, with one hue of the rainbow stained upon each incandescent globe, and each globe set into a lily-shaped bell of white glass. 'Centennial' was the only legend put up on the Fourth of July; there was no attempt at advertisement, but now wrought in equal beauty one reads in illuminated letters of all colors the names of 'Mabley & Carew,' whose enterprise makes this part of the city look as if a feast of light was in progress. The cost of the maintenance of such a display during the three months of the Exposition can only be estimated as being great. The beauty of the arches of iron and fire no one who sees will forget." Credit for this fine piece of work should be given to Mr. Frank E. Perry, the superintendent of the First Cincinnati Edison Company.

Consumers' Electric Light Company.

A certificate was recently filed recording an increase of the capital stock of the Consumers' Electric Light Company, of Chicago, from $100,000 to $200,000.

Brookings, Dak.

A correspondent writes me from Brookings, Dak., as follows: "Brookings, Dak., was for the first time lighted by electricity on the evening of July 3d. E. E. Gaylord has been perfecting a dynamo and arc lamps of his own and new design, and tried them for the first time on the above date. Visitors here the evening of the Fourth pronounced them as bright and steady as any of the old line systems, in fact they woke the people up to a sense of their duty. A few days after Mr. Gaylord and the Hon. G. W. Hopp started out and in three hours secured enough business and capital to start a plant on a paying business. After looking up the different 'old line' systems, they concluded to order, through Mr. Gaylord, a Waterhouse arc dynamo, lamps, material, etc. Mr. Gidding, the inventor and patentee of the Russell & Co. automatic engine, was on the ground and secured an order for a 30 h. p. outfit complete. The plant is to be running in three weeks if possible."

The Auditorium Plant.

The new Auditorium is to be lighted with 8,600 Edison incandescent lights. The plant, when complete, will be the largest isolated incandescent plant in the world. Messrs. Leonard & Izard, of this city, agents for the Edison Company, have been awarded the contract.

Personals.

Mr. C. F. Warner, Manager of the Rockford (Ill.) Electric Power Co., was in the city this week making purchases for the further equipment of his plant. The power for operating this plant will be generated from water power, which will bring the cost per horse-power down to a minimum. Mr. Warner deserves credit for his pioneer efforts in the establishment of this plant, which will be used exclusively for power purposes. He informs me that he has already 150 h. p. contracted for, which will be applied to almost every kind of work, including printing presses, elevators, etc. Motors and generators of the Van Depoele pattern will be used.

D. H. Stedman, Jr., of the Thomson-Houston Company, has been in the East on a combination business and pleasure trip for several days past and will return to Chicago next week.

Mr. E. Winter, manager of the Western Union Telegraph Company, of Montgomery, Ala., was among the callers at the Western office of THE ELECTRICAL WORLD this week. Mr. Winter has been in the telegraph business for a number of years. He tells me that electrical business in the South in all departments is growing fast.

Mr. C. C. Haskins, the worthy custodian of our Electric Club

and electric light inspector is to start next week on a two week's fishing excursion.

Thomson-Houston Company.

The Thomson-Houston Company report recent contracts for installations at the following points: Alliance, O.; W. Bay City, Mich.; Warsaw, Wis.; Menominee, Wis.; Marinette, Wis.; Ottawa. Ill. Helena, Montana; also for apparatus to increase plants at Oakland, Cal., and Los Angeles, Cal.

St. Louis

A correspondent writes me from St. Louis as follows:

The Laclede Gas Light Company, who have been receiving proposals for a 500-light arc plant, have notified the different companies in interest that they have postponed consideration of the matter until fall. The combined arc and incandescent plant for the St. Louis Water-Works is practically abandoned for the present, the bids received being far above the amount of money appropriated. The trade will have an opportunity of figuring later on revised specifications, when it is expected the Westinghouse alternating system will be favorably considered.

The American Electric Company, through its agents here, the Pike Electric Company, have just closed a contract for a 35-light arc machine and 63 single lamps with the St. Charles Car Company, St. Charles, Mo. This company has lately added an increase of 15 American lamps, having originally purchased an Excelsior plant, making now 78 American lamps and apparatus, with a total capacity of 128.

The contract for wiring the new building of the Quick Meal Stove Company, 8th and Choutesw avenue, has been awarded to the Pike Electric Company, who have also sold them a 225-light incandescent plant. The same company are also wiring the fine new residence of Ferdinand Herold, president Cherokee Brewery Company, for incandescent lamps, and will also furnish focusing lamp and a complete incandescent outfit for Peter Hauptman's new Mississippi steamer.

Telephone Quotations.

Col. S. G. Lynch, broker, 146 La Salle street, furnishes quotations upon telephone stock as follows:

Bell of Mo.	$150@$155		Iowa Union	$27@	$28
Central Union	47@	48	Michigan	79@	80
Chicago	350@	375	Missouri and Kansas	70@	71
Colorado	19@	21	Rocky Mountain Bell	40@	45
Cumberland	65@	68	Wisconsin	110@	112
Great Southern	35@	40		E. L. P.	

KANSAS CITY, Mo., July 23, 1888.

The Western Electric Company has reorganized. Mr. William D. McQuesten has sold his interests in the company to Mr. Ford S. Caldwell, and Mr. M. E. Bates has been made general manager.

H. M. Cutter, representing the Loomis system, with soon make a trip to Wichita and Arkansas City, Kan.

Mr. C. H. Cone, representing the Electrical Supply Company of Chicago, has secured the contract for supplying the Kearney (Neb.) Canal and Water Supply Company with a little over 25 miles of P. & B. wire for its incandescent light and motor service.

Telegraph Affairs.

The telegraph companies are now creating a little more interest than is usual. The Pacific Mutual, which is the Western extension of the Postal, recently reorganized, and Mr. Geo. M. Meyers, the manager, unloaded on the other stockholders or was frozen out, depending upon from what point you take your view, and retired. But Mr. Meyers did not retire from the Home Signal Telegraph and Messenger Company, but owns a controlling interest in that concern. Heretofore it has been identical in this city with the Pacific Mutual Telegraph Company, and carried messages to the latter office free of charge, and charged away up in G for carrying messages to the Western Union. Now the Western Union and Home Signal Company have issued a joint announcement that on and after Monday, July 16, the Home Signal Company will carry messages to the Western Union free of charge, and the Pacific Mutual has issued an announcement conveying the same information, and also that the Pacific Mutual would establish a system of call boxes and will carry its own messages. The Western Union and Home Signal have undoubtedly formed a combination to drive out the Pacific Mutual, but it is not probable they will succeed.

George W. Conover, formerly assistant-general manager of the Home Signal Company, has accepted the agency of the Electric Protection Supply Company, of Chicago, and is meeting with great encouragement. His territory includes Kansas, Nebraska and Western Iowa. The "protection" is in the form of matting to be placed under the carpet at doors and windows.

Electricity and Lunacy.

Electricity has just had a hand in driving a man insane. Dick Edwards, who has lived in Kansas City, Kan., just across the river from Kansas City, Mo., knew more about electricity than Edison has ever dreamed of in his wildest moments. He has invented forms of applying electricity by the side of which the telegraph, telephone and phonograph sink into insignificance. Edwards was so susceptible to the element, that the latent electricity in the atmosphere conveyed words and messages to his ears from far off India and Japan. He became somewhat dangerous to the community, and he will now continue his electrical labors in the Kansas asylum for the insane.

Telephone Rates.

The council has appointed a committee to investigate the telephone rates. This committee will ascertain what the rates are all over the country, what the expenses are, what the profits and what the rates should be. The committee will, undoubtedly, know more about the telephone business when its work is completed than now, and will be able to increase the telephone knowledge of the city also. One member of the committee already knows more about in than he did. Heretofore he always thought one wire was sufficient to connect fifteen or twenty, or perhaps fifty telephones with the exchange When he learned to-day that there had to be a separate wire for each telephone he was simply astounded.

Electrical Camping Out.

Alderman Wood, manager of the Western Union Telegraph office in this city, Wheatstone Chief Hatch and Chief Operator Brownson, and their wives and families, are camping out for the summer in a lovely little rural spot about ten miles from the city. They are on the bank of a small stream, they quench their thirst at an icy cold spring not a hundred feet away, and the men go back and forth between their camp and the city on a dummy line that runs within a hundred yards of the camp.

Independence, Mo.

The Presbyterian church at Independence, Mo., a distant suburb of Kansas City, has been wired for 161 incandescent electric lights. When this is completed this church will be the only one west of Chicago lighted by electricity.

Fire Alarm Service.

Arrangements are being made for giving a thorough test to a new plan for improving the fire alarm system in this city. The telephone system is the fire alarm system in this city. Chief Hale, of the fire department, says it is the best in the world, but it is not perfect. It is subject to delays sometimes of a minute or more, and when there is a fire any second is a minute. This delay is caused by the inability to get "central" promptly. According to the system which is soon to be be tested, there will be no delay. A series of loops in connection with the telephone wires will be run through the business and more thickly resident portion of the city, direct to the headquarters of the fire department, where they are connected with a battery. These loops can be tapped by any number of telephones. This is done by an armature, two electro-magnets and a lever contained in a box which can be placed near the telephone or in an adjoining room. Pull down the lever and the armature connects the telephone with the fire department; then yell "fire" and the fire department hears you. Should the telephone exchange be burned the loops would still preserve the fire-alarm system. The police department also depends upon the telephone system at present for its police alarm, but it finds it deficient. One important objection is that no communication from a policemen on his beat to headquarters can be made in secret by the telephone. The frequent delays in getting connections and the scarcity of telephones in the residence portions are other objections. The Board of Police Commissioners has been considering for some time the feasibility of establishing a system of police patrol boxes. The only objection the Commissioners have to doing so is the lack of money. The appropriation for the department is just enough to cover the running expenses, and to establish the boxes it will be necessary to cut down the other expenses. It is proposed to do away with the mounted police in the suburban districts, sell the horses, and also cut down the number of patrolmen. It is estimated that the box system can be run for $5,000 a year and this cut in the expenses would leave the board just about that much for the new departure.

SOUTHERN NOTES.

BALTIMORE, Md., July 27, 1888.

The Brush Electric Lighting Company of Baltimore has just completed the installation of an additional engine of 100 h. p. capacity, to supply the increasing demand for current operating Baxter motors. They are now running three large engines on motor circuits exclusively. There are nearly 200 Baxter motors in Baltimore, and the demand is constantly increasing.

As soon as the Baxter Company can furnish the Brush Company with some of their new generators, they will be compelled to put in several more engines of larger capacity than the above, as there are already several applicants for larger power than can be furnished with the dynamos now in use.

It is this healthy and progressive state of affairs that has led the local Brush Company to work out plans for a new station, which will be in operation before the end of the year. This station promises to be the largest in the world, as it will have a capacity of between 4,000 and 5,000 h. p., while in point of careful detail it will be all that experience and ingenuity can make it. Mr. David Evans, who has charge of the present station, and Mr. Archer, the architect, have recently made a tour of observation through the land, not so much with the object of copying any good thing they may see as of devising something better. The building will be 60 × 200, three stories high, with a stack rising 180 ft. and 9 ft. in the clear. The engines will be on the first story, the dynamos on the second, and the work and store rooms on the third. Three Buckeye engines, each of 250 h. p., have been ordered as a first addition to the existing steam plant, or such as is already being added, and these Buckeyes will each drive a 2,500 light Westinghouse alternating machine.

ENGLISH NOTES.

LONDON, July 18, 1888.

Edison-Swan v. Anglo-American Brush Company.

The long looked for judgment of Mr. Justice Kay in the action to test the validity of the Edison lamp patents was delivered on Monday morning last. I have already sent you a brief telegram summarizing the issue. It cannot be said that the decision, which invalidates the Edison patent, has come upon either plaintiffs or defendants in the shape of a surprise. It was evident at an early period of the trial that the defendants had succeeded in impressing the judge with the fact that they were able to bring forward evidence of the first importance which had not been presented to the court in the previous action in which Messrs. Woodhouse & Rawson were concerned. In delivering judgment Mr. Justice Kay remarked that he would have been bound by the decision of the Court of Appeal in that case, but for the fact that the court had been misled with regard to the statement that in the lamps made by Swan before the date of Edison's patent, the carbon was shaped after and not before carbonization. It is now admitted that this was not the fact. Moreover, in the previous case no evidence whatever had been tendered with regard to the practicability, or otherwise, of making carbon filaments by the various processes described in the Edison specification. Neither was there anything said as to the sufficiency or utility of any part of the patent, and very little evidence was given with respect to the previous state of the knowledge of the art. Taking into consideration all that had been brought before him upon these several points, Mr. Justice Kay expressed the opinion that the learned judges of the Court of Appeal, if they had had before them the same materials upon which to form an opinion as was now before him, would have come to the same conclusion as he had done. The learned judge construed the claims of the Edison patent in the following order: "(2) A combination of four requisites for a lamp; (3) and (4) claims for two of those requisites separately; and (1) a claim for particular modes of making and attaching to platinum wires the first item of the combin tion, viz., the carbon fila ent. But claim 2 comprehends lamps containing carbon filaments, however made, and not only those made in the special modes described in the body of the specification and included in claim (1). If this claim can be sustained the defendants have clearly infringed it."

The learned judge then went on as follows: "Suppose the claim had been thus worded—I have succeeded in making an electric lamp with a carbon burner, say $\frac{1}{100}$ inch in diameter, which gives a high resistance, and I claim a monopoly of all lamps with carbon burners but thicker than that, however made. Could such a claim be supported? Yet that in effect was Edison's second claim. It seems impossible to say that Edison, by reducing the thickness of the horseshoe carbon, had made any vast invention or contributed largely to the knowledge which such inventors as Swan and Lane-Fox already had on the subject."

His lordship was, therefore, decidedly of opinion that claim (2) was far too wide to be sustained. He thought that Sir Frederick Bramwell had put the case for the plaintiffs in the strongest and most favorable manner by saying that Edison made the first commercially successful lamp. But this statement had not been borne out by the evidence brought before him. In the cross-examination of the plaintiff's witnesses they had again and again been challenged to prove that any lamps made according to the processes described in this patent were commercially successful. Moreover, the experiments which had been conducted on purpose to test this question, led to the conclusion, that, although it was possible to make lamps according to the methods described, yet such lamps when made were not of sufficient durability to command commercial success. Finally his lordship summarized the reasons which induced him to pronounce the patent invalid in the following terms: "My opinion is that the patent of Edison's No. 4,576 of 1879 is invalid—first, because the second claim is for a monopoly of incandescent lamps containing a filament of carbon for a burner, which claim, I think, is far too wide, considering how little Edison had actually invented; secondly, because his specification does not describe a lamp which ever became, or, as I think, could have become, commercially successful; thirdly, because the directions therein contained are so insufficient that no one could have made the carbons he describes without considerable previous experiment; fourthly, because one of the processes described, viz., mixing the carbon with a volatile powder, I believe to be practically injurious if done as Edison directs; fifthly, because the coating with a non-conducting, non-carbonizing substance, if not injurious, is of no practical utility; sixthly, because the same may be said of coiling the filaments, on which the patentee lays great stress." With regard to the Cheesbrough patent, he was distinctly of opinion that the defendants were guilty of infringement. They had sought to show that the reduction of carbon upon carbon by heating in an atmosphere of hydrocarbon was first invented by the French chemist Despretz. But even admitting this to be the case, the Cheesbrough claim was for the employment of this process in the improvement of carbon filaments for incandescent electric lamps, and this he held to constitute a perfectly valid claim. The patent should therefore be upheld. In the case of both patents, the costs would follow the issue." I am unable at the present moment to say whether or not the case will be carried before the Court of Appeal. When the trial first commenced it was taken for granted that whatever might be the immediate issue the case would be fought out to the bitter end, but at that time it was not expected to last more than a week or ten days at the outside. The trial has, however, extended to such a length that the costs must now amount to probably three times the sum anticipated by either side, and it is quite on the cards that the present decision may be accepted as final. I need hardly say that every one here devoutly hopes that this will be the case.

Proposed Electrical Section of the London Chamber of Commerce.

On Friday last a meeting was held in the rooms of the London Chamber of Commerce, to which all members of that chamber who were interested in the electrical trades were invited, with a view of considering the desirability of forming an Electrical Trades Section. This movement has grown out of the agitation which existed about eight months ago, at which time the pros and cons of the question of forming an Association of Electrical Engineers to deal with commercial matters was much discussed, and in the advocacy of which the *Electrician* here took a leading part. It is pretty well known that although the scheme was allowed to drop for the time being, it had by no means been altogether lost sight of. The modified form in which it now appears as a proposal to form a branch of the Chamber of Commerce has much to recommend it in regard to the advantage which it offers in overcoming the preliminary difculties. In the London Chamber of Commerce we have in fact a powerful organization, holding a most important and prominent position in the commercial world, and yet permitting by its organization the utmost freedom of action in its various trade sections. At the preliminary meeting to which I have referred, the following resolutions were carried: That the formation of an electrical section is desirable; that the members present form a provisional committee for the purpose of organizing an electrical trades section; that meanwhile they use their best influence to induce their friends to join the section, and that a circular be issued in the name of the provisional committee to the trade, inviting them to attend a meeting on the 27th of July.

Swaby v. Watt and others.

Since my last note on it, the affairs of the unfortunate Maxim Weston Company have been dragged into the High Court of Justice, and it is evident that Mr. Justice Stirling, in common with many others, thinks there is something remarkably "rotten in the state of Denmark." Mr. Lewis Swaby recently brought an action against Mr. Hugh Watt, M. P., to restrain the defendant from forfeiting or cancelling the 400 shares in the company held by him, and to restrain the defendant from excluding the plaintiff from board meetings or in any way interfering

with his acting at a director of the company. Mr. Swaby gained his points all along the line. Mr. Justice Stirling in giving judgment said that the evidence adduced in the case showed that some very singular transactions had occurred. He doubted the *bona fide* nature of the minute excluding Mr. Swaby from acting as a director, and remarked that it was one of the most surprising minutes he had ever heard of. "Could he believe it, after the melancholy exhibition which he had seen in the witness-box? It was a mere story got up by Watt in order to protect his position and to justify his high-handed proceedings with reference to the forfeiture of the plaintiff's shares." His lordship concluded by granting an injunction in the terms of the plaintiff's motion.

The Pilsen-Joel Company.

This is another unfortunate electric lighting company which seems to be rapidly drifting on to the rocks of the Bankruptcy Court, owing to woful mismanagement. The affairs of the Pilsen-Joel Company have not been characterized by the high-handed proceedings which have made the Maxim-Weston Company so notorious, but the want of business like capacity has been even more apparent. An extraordinary general meeting of this company was held at the Cannon Street Hotel a week or two ago at the requisition of the shareholders, and after a long discussion it was decided to empower the directors to dispose of the company's business, and failing a good offer, to consider as to the possibility of carrying it on at a profit. A committee of four shareholders was also appointed to act with the directors. Some of the shareholders, among whom was a Mr. James Fyfe, failed to see the necessity for this happy dispatch process at all, since the company under its present utterly inefficient management is earning over £5,000 per annum and has central stations in some of the most advantageous sites in London. However, the majority of the shareholders are evidently sick of the whole affair and anxious to be rid of it at any price.

The Cadogan Electric Light Company.

I have recently paid a visit to a central station which was started some three months ago in the district of Chelsea. The plant at present in operation is of very modest dimensions, consisting of 3 Leeds dynamos, driven direct by belting by Armington & Sims engines, and having a total output of over 100,000 watts. The station itself, however, has been built to accommodate a plant of at least thirty times the present size, and I believe that there is every prospect that the demand will speedily rise to something approaching this figure, provided that the working of the station is reasonably satisfactory. The system adopted is that of battery-transformers, that is to say, each consumer is supplied with a battery which is charged by a constant current from the central station. The details of the method adopted are somewhat peculiar. The voltage of the lamps and the number of the cells in each individual installation is varied according to the size of the installation; the larger the number of lamps, the higher their voltage and the larger the number of cells in the battery and vice versa. One-fourth of the total number of cells is always in connection with the charging mains, the remainder being upon the lamps. By means of an automatic switch the set of cells upon the mains is switched out of the charging into the discharging circuit, and another set is simultaneously made to perform the reverse operation; these changes take place at regular intervals of one, two or three minutes as may be desired. The three dynamos have each an output of 70 ampères, and are connected in series, giving a total E. M. F. of 1500 volts. The machines are separately excited from a secondary battery at present, although I suppose when more machines are added a dynamo will eventually be used for the purpose of excitation.

THE TELEGRAPH.

Western Union Receipts.—Western Union's test office receipts the second week of July will show an increase of $30,000, it is said.

South America.—New cable extensions give this country connection with Venezuela, San Domingo, etc., and the fact is the cause of considerable congratulation among South Americans along the Spanish main.

The New Pacific Cable.—The exact route of the new cable from Vancouvers to Australia, in the project for which Mr. Sanford Fleming is interested, has not yet been determined, but, roughly speaking, it will run from Vancouvers, British Columbia, to the Hawaiian and the recently annexed Fanning and Fiji Islands, thence to New Zealand, and from there to Australia. The cable will be 6,800 miles long, but the longest stretch will not be over 2,000 miles.

THE TELEPHONE.

The Southern New England has declared a quarterly dividend of 1¼ per cent.

Dallas, Tex.—The Erie Company are to spend $5,000, it is said, in improving their plant.

The American Telephone and Telegraph Company has been incorporated at Chicago by R. C. Witmore and others, with a capital stock of $10,000.

Milwaukee, Wis.—The American Telephone and Telegraph Company of Wisconsin has been incorporated by Messrs. McLeod, Morris and Miller, of this city, with a capital stock of $10,000. This company will operate their lines on the metallic loop system. They expect to have several lines in operation between Milwaukee and Chicago before fall.

The New England Company.—At a meeting of the directors of the New England Telephone and Telegraph Company, July 25, a dividend of seventy-five cents per share was declared, payable on Wednesday, Aug. 15, 1888, to stockholders of record at the close of business on Tuesday, July 31, 1888. The transfer book will be closed from Aug. 1 to Aug. 14, 1888, both days included. The quarter shows gross receipts of $280,116, expenses of $189,791, and net earnings of $90,324. The construction account was $23,249.

THE ELECTRIC LIGHT.

Camden, N. J.—The Cooper Hospital is to be lit by electricity.

Pine Bluff, Ark.—Jones & Thompson are to put in an electric light plant.

Sherman, Tex.—The Sherman Electric Light Company are moving their plant.

Athens, Ga.—The Athens Gas Light Company propose to go into electric lighting.

Stafford, Md.—Mr. H. Stokes is putting an electric light plant in his flint mills.

Minerva, O., has a 25 arc light plant furnished by the Silvey Company, of Lima, O.

Paducah, Ky., is to have a Westinghouse alternating plant, and a company has been formed.

Norfolk, Va.—Proposals for city electric lights will be received by J. M. Broughton until August 1.

San Francisco, Cal.—The California Electric Light Company proposes to build a new station.

Gadsden, Ala.—The Queen City Electric Light Company are adding another dynamo to their plant.

Fostoria, O.—The Fostoria Electric Light Company has been formed with a capital stock of $25,000.

Mansfield, O.—A Westinghouse alternating plant is to be put in at Mansfield, under the McBride franchise.

Dexter, Me.—Amos Abbott & Co. are to light their woolen mill by electricity, driving the dynamo by water power.

Orange, Tex.—Lutcher & Moore are pushing ahead with their electric light plant, and are now buying wire for it.

Brunswick, Ga.—Mr. W. A. Robinson has contracted to light the city, and will erect a Thomson-Houston plant at once.

Walla Walla, W. T.—The Walla Walla Electric Light and Power Company has ordered an arc plant from the American Company.

Paris, Tex.—The Paris Gas and Electric Light Company is spending $30,000 on extensions, which will include an incandescent dynamo.

Little Rock, Ark.—The Little Rock Edison Electric Light and Power Company has been formed, and will put in a plant at an early date.

Wabash, Ind.—The electric light plant at Wabash, Ind., has been visited by lightning, and damaged to the extent of several hundred dollars.

The Thousand Islands.—The Thousand Islands Electric Light and Power Company has been incorporated at Clayton, N. Y., by H. S. Parker, C. A. Ellis and others, with a capital stock of $15,000.

Ellensburg, W. T.—The Ellensburg Light and Power Company has been formed by J. A. Shandy and others, with a capital stock of $25,000.

Akron, O.—The Akron Electric Light and Power Company has been incorporated by A. Squire and others, with a capital stock of $100,000.

Columbus, S. C.—The Congaree Gas and Electric Light Company have awarded the contract for the erection of their plant to G. B. Edwards, of Charleston.

The International Electric Company, of this city, has been incorporated by H. A. Manning, E. E. Garvin and others, with a capital stock of $100,000.

Rockland, Me.—The Highland Electric Light Company, of Rockland, Me., has been incorporated by G. Gregory and others, with a capital stock of $1,000,000.

Port Huron, Mich.—The plant of the Excelsior Electric Light Company, at Port Huron, has been destroyed by fire, the damage being estimated at $15,000.

The Occidental Construction Company has been incorporated at San Francisco, Cal., by L. I. Bromwell and others to put in gas and electric lighting plants, etc.

Chattanooga, Tenn.—The local Brush Company and the Hauss Electric Light Company have consolidated under the name of the Chattanooga Electric Light Company.

Englewood, Ill.—The Englewood Electric Light Company has been incorporated by J. Badenoch, Jr., J. I. Badenoch and C. T. Page, with a capital stock of $50,000.

San Francisco, Cal.—The Harding Electric Manufacturing Company of San Francisco has been incorporated by I. B. Roby and others, with a capital stock of $1,000,000.

Denver, Col.—The South Side Electric Light Company has been organized at Denver, Col. The capital stock is $100,000. A 7,000-incandescent light plant will, it is said, be established.

Burlington, Ia.—The Burlington Edison Company has been formed with a capital stock of $200,000. Mr. E. Hegeman is president, Mr. T. W. Barhyrdt treasurer, and Mr. C. J. Reed manager.

Portsmouth, N. H.—Superintendent Palmer of Portsmouth, N. H., has completed arrangements for an electric service of 1,500 lights. There are now in operation nearly 800 lights in the city.—*Manufacturers' Gazette.*

Yonkers, N. Y.—The Thomson-Houston Electric Light Company of Yonkers has now been incorporated by H. L. Storke, R. E. Alexander and others, with a capital stock of $100,000. The plant is a large and growing one.

Denver, Col.—One hundred additional Edison municipal lights have been ordered for the streets, and the contract with the Colorado Electric Light Company has been renewed for five years, at $36 per lamp. This makes 900 incandescents in use for street lighting.

Olean, N. Y.—The Olean Electric Light and Power Company has its incandescent plant now in full operation. It has a Westinghouse alternating dynamo of 650 lights, run by a 65 h. p. Ball engine, and already has contracts for over 500 lights. The plant was installed by Mr. F. B. Roney and Mr. W. J. Reilly, of Pittsburgh.

Electric Light Jelly.—A new table ornamentation is jelly illuminated by electric light. The dish, hidden from observation at first by a silver cover and a mass of flowers, is suddenly revealed with the light shining through the mass from the centre, and the effect is electrifying.—*Ex.*

Albany, N. Y.—At a meeting of the trustees of the Edison Light and Power Company, of Albany, on July 25, the following were elected officers of the company for the ensuing year: President, George W. Kirchwey; vice-president, James W. Hitt; secretary and treasurer, Wm. K. Harcourt.

Sing Sing, N. Y.—A contract has been entered into between the Sing Sing Prison and an electric light company by which the company will furnish Sing Sing with electric lights. The company will put its plant in one of the shops of the prison soon to be unoccupied, and have the use of the prison engine to run its dynamos. In return the company will light the prison.

Sheffield, Ala.—The electric light works department of the Sheffield Land, Iron and Coal Company now has an equivalent of 900 16 c. p. lamps connected, giving general satisfaction, and lighting up everything from tents to the fine bank building. The capacity of the plant is to be increased, and the addition will probably be a 1,300 light Westinghouse alternating plant and steam power to match.

APPLICATIONS OF POWER.

Lafayette, Ind.—Work has begun on the electric road for Lafayette.

North Adams, Mass.—The articles of incorporation have been drawn for the North Adams Electric Railway Co.

Easton, Pa.—Trouble has arisen over the pole line for the electric road at Easton, but the poles appear to be going in.

The Tesla System.—The Westinghouse Company has purchased the patents on Mr. Nikola Tesla's alternating current motor system, which has lately been the object of so much attention. It is stated that the motors will soon be on the market.

Rochester, N. Y.—The Sprague Electric Railway and Motor Company have just sold one of their 20 h. p. combination motor and pumps to Stein, Block & Co., Rochester, N. Y., for the purpose of operating the elevators in the fine new building now being erected by the above firm.

Cleveland, O.—The Sprague Electric Railway and Motor Co., after a thorough investigation of the subject by the officers of the local company, have been awarded the contract to equip the Cleveland, O., electric road. This is to be a very complete equipment, consisting of 8 miles of track and 16cars, iron poles, etc.

Boston, Mass.—The Sprague Electric Railway and Motor Co. have closed a very important contract with the West End Railway Company, of Boston, Mass. The present equipment will consist of 12 miles of track and 20 cars, and everything is to be as complete in all its details as possible, with ornamental iron poles, etc.

Motors in Cleveland.—The Baxter motors are now making headway very rapidly in Cleveland, O., and if they keep on at their present rate the city will be one of the largest users of motors in the country. Although Mr. W. B. Cleveland, the local agent of the Baxter Motor Company, has only been working up the motor business a few months, he has now in the neighborhood of 100 h. p. in use.

Des Moines, Ia.—H. O. Woodruff, Sprague agent at Des Moines, Ia., reports recent orders for motors from C. B. Atkins, pumping pipe organ; Des Moines Street Railway Company, horse-cleaning machine; Tilden's Shirt Factory, sewing machines; Des Moines Wire and Scale Works, lathe and emery wheels; Des Moines *Daily Leader*, a five horse-power for printing press; also a number of small C. & C. motors for various uses.

Buffalo, N. Y.—The Great International Fair at Buffalo, which opens on September 4, promises to be very attractive. It will include several electrical displays. An electric road will encircle the grounds. Electric lights and storage batteries will also be on exhibition, and it is said that the Edison phonograph will be shown. The main exposition building will cover 90,000 square feet, and the grounds embrace more than 100 acres.

Gilt-Edged Motors.—The electric motor has passed its experimental stages, and the day seems to be rapidly approaching when every house will find something for it to do in lifting burdens from floor to floor and performing every possible labor that can be done by machinery. Manufacturers have not yet begun to construct motors ornamented with gold leaf, mother of pearl and precious stones to rock cradles in the nurseries, but these requirements will come in time.—*New York Sun.*

PERSONALS.

Mr. P. V. Burns, of St. Louis, is on a trip to New York, looking into matters electrical.

Mr. Wilson Howell, formerly superintendent of the Edison station at New Brunswick, N. J., has recently been engaged in the reconstruction and modernizing of the Edison stations at Renovo, Williamsport, Sunbury and Lancaster, Pa. These were all among the first Edison stations built, and have largely profited by the work of Mr. Howell, who is an expert in the three-wire system.

Mr. D. H. Craig, of this city, has, on the recommendation of Senators Blair and Edmunds, been granted the use of a corridor in the U. S. Senate galleries, to exhibit inventions by which, it is alleged, cheap telegraphy for the people can be had. Senator Blair appeared to give to Mr. Craig the credit of inventing rapid telegraphy and founding the Associated Press. Probably he possesses some exclusive information on the subject. It is proposed that the country shall buy Mr. Craig's inventions.

Mr. C. H. Maclilie.—The New York State agency of the Sprague Electric Railway and Motor Co. has been very fortunate in securing the services of Mr. C. H. Maclilie, of Chicago, Ill., to act as its representative in Eastern New York. Mr. Maclilie is a trained

salesman, a thorough business man, and has held important and responsible positions in the electrical field. Mr. Higgins is to be congratulated upon his success in securing, in so short a time, an efficient and able staff of representatives; and his agency in Buffalo, though among the youngest of the Sprague branch houses, is rapidly pushing its way to the front.

MISCELLANEOUS NOTES.

The Kay Electric Company has been incorporated at Montreal, Can., with a capital stock of $3,000.

The Edison Machine Works at Schenectady, N. Y., were the scene of a small fire on Saturday last, when the foundry was damaged to the extent of $32,000; insurance, $75,000.

The American Electric Register Company has been incorporated at Portland, Me., by C. F. Howe, of Boston, C. A. Kellogg, of Newton, Mass., and others, with a capital stock of $200,000.

New York City.—The proprietors of the Hoffman House hotel want the poles and wires removed from before their establishment, and as the Mayor complains of lack of funds they offer their check to meet the expense.

The American Graphophone Company, Washington, D. C, has, it is stated, leased the abandoned plant of the Howe Sewing Machine Company, Bridgeport, and will soon be turning out talking machines. It will employ 100 hands.

The Woodworth & White Company has been formed at Waterbury, Conn., for the manufacture of electrical supplies, with a capital stock of $40,000. Mr. A. C. Woodworth is president, Mr. L. S. White Secretary, and Mr. A. C. Mintie Treasurer.

Woonsocket, R. I.—James H. Cary has been awarded the contract by the fire department to put in heavy current protectors on all the boxes, tappers and fire alarm bells, to protect them from lightning and electric light currents. Thirty-six protectors will be put in. He is also laying the electric wires in the new opera house under the contract awarded the Woonsocket Electric Machine and Power Company.

An Electric Fare Protector.—The Brooklyn street car companies are considering the introduction of an electric fare protector, says the New York *Sun*. Whenever a passenger steps on the car a fare will be rung up on the indicator, and the conductor will have to account for it. The Brooklyn companies run too many miles of railroads to have spotters along the track the whole way, and they fear that they do not receive all the fares they should. A man who has invented the electrical indicator wants them to adopt it. It would insure the companies' receiving more money than they get now, but the drivers would have to keep newsboys and lozenge peddlers off the cars or pay their fares, and if two passengers should step on at once the conductor could "knock down" a fare.

The Phonographic Clock.—Edison is a great inventor He has combined the phonograph with the clock in a most ingenious manner. Instead of striking the hour, the clock calls out in well modulated tones, "Dinner time," "1 o'clock," "2 o'clock," etc. Many variations to which this invention may be subjected at once suggest themselves. An alarm clock will doubtless be constructed which, at the appointed hour, will begin to deliver a gentle exhortation to "Get up; it's 6 o'clock already." If the sleeper does not rise and check the clock, it will continue with gradually increasing emphasis, until it speaks in thoroughly unmistakable tones, spiced, if need be, with appropriate quotations from Scripture. Then the clock will have other combinations adapted for other purposes. The fond parent, whose daughter is being sparked, will have a clock which, at about 10 P. M., will sing out: "Young man, it is about time you decamped." A lady who gives parties will have a clock which at the proper hour will say, "Good evening, ladies and gentlemen; it is bedtime." And so forth. The phonographic clock is destined to fill a long felt want.—*Norwich Bulletin.*

BUSINESS NOTICES.

Jordan & Gottfried, 208 Canal Street, N. Y., carry a complete stock of iron and brass machine and wood screws, bolt cap and set screws, taps, dies, files, twist drills, brass and rubber tubing, rod and sheet copper, brass, German silver, steel and iron wire, shafting, tools, etc.

The Partz Electric Battery Company, of Philadelphia, having found their old quarters at 1,723 Chestnut street too small, have leased the large building at 636 Arch street, same city. They are now prepared to fill all orders promptly, and in addition to their large line of Open Circuit and Gravity and Motor Batteries, have a full line of small Motors and Dynamos. Send for their price list and catalogue, or write to them stating what you want.

OUR ILLUSTRATED RECORD OF ELECTRICAL PATENTS.

PATENTS DATED JULY 17, 1888.

(1) 10,944. (2) 10,945. (Re-issues.) **Electrical Conductors;** Edward Weston, Newark, N. J. Applications filed April 17, 1888. For description see THE ELECTRICAL WORLD, July 21, 1888.

386,189. Electrical Bulletin; P. B. Delany, New York, N. Y. For description, see THE ELECTRICAL WORLD, July 21, 1888.

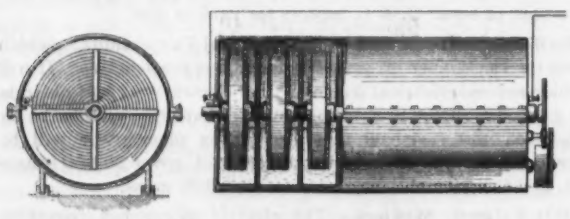
386,281. Method of Blasting; M. Waddell, New York, N. Y., filed Jan. 13, 1888. The drill hole is partially filled with expansible material, through which passes an electrical conductor, the hole is then plugged up, the current turned on and the rock separated by the expansion of the material caused by heat generated by the passing of the current through it.

PATENTS ISSUED JULY 24, 1888

10,949 (Re-issue). **Coin Operated Induction Coil;** Percy G. Williams and Alfred W. Roovers, of Brooklyn, N. Y., said Roovers Assignor to said Williams. Application filed Nov. 1, 1887. In this apparatus, after the coin has been inserted and the handles grasped, the current received may be regulated by pushing in upon the handle.

386,463. Electric Valve Controller; Emil Grah, of Toledo, Ohio, Assignor of one-half to William Grah, Jr., of same place. Application filed Jan. 25, 1888. The circuit embraces an electro-magnet whose armature is adapted to control the valve, an annunciator, a pressure gauge, and a bell. The closure of the circuit, at any time, operates the valve and the translating devices in circuit.

386,541. Railway Signal Circuit Breaker; Edward B. Ives, of New York, N. Y. Application filed Nov. 12, 1885. A key block composed of a horseshoe magnet, a piece of iron so pivoted as to swing one of its ends between the poles of said



386,580. STORAGE BATTERY.

magnet, and to make contact with one or the other thereof as it may be swung in one or the other direction, and adapted to have its position changed by the passage near its end of the pole of a powerful magnet of similar polarity to that of the pole of the horseshoe magnet, with which the free end of the pole piece is at that time in contact; a circuit wire is attached to the pole piece, the other circuit wire being attached to the contact post, which is so located that when swung in the other direction it breaks the contact therewith.

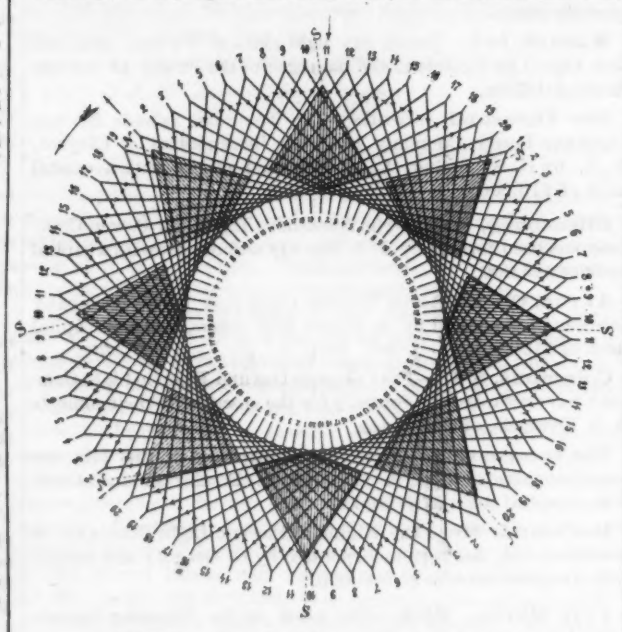
386,543. Compound Electromotor for Electric Railways; Alfred J. Jarman, London, England. Application filed Nov. 24, 1888. Patented in England, Feb. 26, 1886, No. 2,783. Two motors are used. One is adapted to run the car forward and the other backward. Their brushes are connected on the same shaft, and by the movement of a single lever controlling the brushes the movement of the car is controlled. By dropping both sets of brushes on to the commutators at once a braking action is exerted.

386,561. Machine for Covering Wire; Wm. H. Sawyer, of Providence, R. I. Application filed Nov. 28, 1884. The improvement consists mainly in the arrangement of the powder box for supplying powder to the rubber sheathing of the wire. The powder box has a series of apertures in its side. It is divided up into three compartments, one for the powder, another for wiping material and the third for retaining the powder wiped from the wire. See illustration.

386,560. Porous Cup; B. J. and J. W. Wheelock, New York, N. Y. Application filed Sept. 18, 1887. The porosity of the cup is regulated by successive impregnations with paraffine.

386,580. Storage Battery; John A. Enos, of Boston, Assignor to Wm. C. Otis, of Nahant; E. H. Ingalls and Paul West, of Brookline, and Wm. E. Plummer, of Newton, Mass. Application filed Feb. 13, 1888. The cells consist of a circular casing in which is mounted a shaft carrying the positive and negative elements of the battery. The elements are spirally wound upon each, but are separated by a block of insulating material. The shaft is rotated by clockwork continuously, thus bringing new portions of the battery elements into the solution. See illustration.

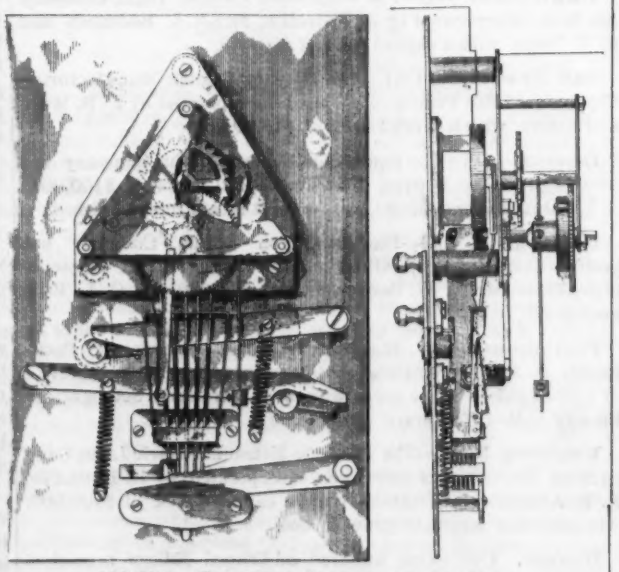
386,581. Current Receiver for Electric Railway Cars; John A. Enos, of Boston, Assignor to Wm. C. Otis, of Nahant; E. H. Ingalls and Paul West, of Brookline, and Wm.



386,775. DYNAMO-ELECTRIC MACHINE.

E. Plummer, of Newton, Mass. Application filed Feb. 13, 1888. The car is provided with elongated contact strips, which take current from a pair of brushes located at intervals along the line of the road. The current is conducted from the strips to storage batteries on the car. The battery is thus re-enforced at intervals.

386,597. Electrical Call System; James C. McLaughlin, Kansas City, Mo. Application filed April 9, 1887. The drops



386,772. ELECTRIC SIGNAL OR ALARM.

and pivoted registers in the annunciator can only be operated from the rooms, so that when a guest has been awakened and answers, his answer is registered by himself and there can be no dispute about his having been called.

386,602. Electric Governor; Horace W. Parsons and John Hoduit, of Wamego, Kansas. Application filed Sept. 26, 1887. The movement of governor balls beyond certain limits causes a break in the circuit of the field or armature which is restored when the speed decreases.

386,646. Electrical Typewriter; James F. McLaughlin, of Philadelphia, Pa. Application filed November 17, 1887. A series of segments, each electrically connected with a circuit controller, a vibrating commutator electrically in contact with the segments and included in the line circuit, and a circuit controlling switch for connecting and disconnecting the segments with the circuit.

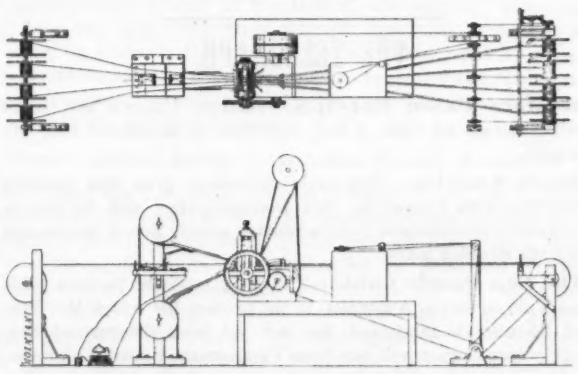
386,648. Inductometer; Georges Miot, Paris, France. Application filed March 7, 1888. Patented in France Sept. 13, 1887, No. 185,799, and in Germany Nov. 5, 1887, No. 5,470. For description see page 57 this issue.

386,685. Dynamo and Motor; Charles Eugen Lancelot Brown, of Zurich, Assignor to the Werkzeug und Machinenfabrik Oerlikon, of Oerlikon, Switzerland. Application filed Nov. 9, 1887. For description see THE ELECTRICAL WORLD, July 23, 1887.

386,729. Telegraph-Key; Louis Townsend and John C. Auten, of Evansville, Indiana. Application filed March 15, 1888. Trunnions and pivots are dispensed with by bifurcating the rear end of the key lever and flattening them out to form springs, and bolting their ends rigidly.

386,754. Electro-Medical Apparatus; John S. Muir, San Francisco, Cal. Application filed Jan. 23, 1888. Contact is made with the body through a rolling electrode. The improvement consists in making the handle and frame of the electrode separable for convenience in packing.

386,772. Electric Signal or Alarm; Edward Davis, Cambridge, Mass., Assignor of one-half to E. B. Welch,



386,561. MACHINE FOR COVERING WIRE.

of same place. Application filed May 13, 1887. This consists of a conducting strip, a movable contact-arm, one or more projections adapted to be moved into position to cause changes in the relation of the contacts, a catch for holding the projections in position during the passage of the movable contact-arm over them, and a projection connected to the movable contact-arm, adapted to co-operate with and move the catch out of engagement with the projections when the contact-arm has passed by them. See illustration.

386,775. Dynamo-Electric Machine; Waldemar Fritsche, Berlin, Germany. Application filed Nov. 4, 1887; patented in Belgium, Sept. 27, 1887, No. 79,008; in France, Sept. 27, 1887, No. 186,093, and in Austria-Hungary, Feb. 26, 1888, Nos. 37,999 and 6,190. An armature for a multipolar dynamo-electric machine having two series of contact-points arranged either parallel to or concentric with one another, a conductor connecting the contact-points, arranged to form a series of partial triangles having their apices at the contact-points and imaginary bases, the conductor being continued progressively throughout the entire series of contact-points, so that at the termination of the winding the conductor returns upon itself at the point of starting. See illustration.

386,784. Overhead Wire Connection for Electric Railways; Walter H. Knight, of New York, N. Y. Application filed May 10, 1888. A long spring pivoted to the end of the car, carries at its upper end, between guards, a grooved roller, for taking the current from the line. A latch is provided at the pivot of the spring for locking the spring in its upward position against the conductor.

Copies of the specifications and drawings complete of any of the patents mentioned in this record—or of any other patents issued since 1866—*can be had for* 25 *cents. Give the date and number of patent desired, and address Johnston's Patent Agency, Potter Building, N. Y.*